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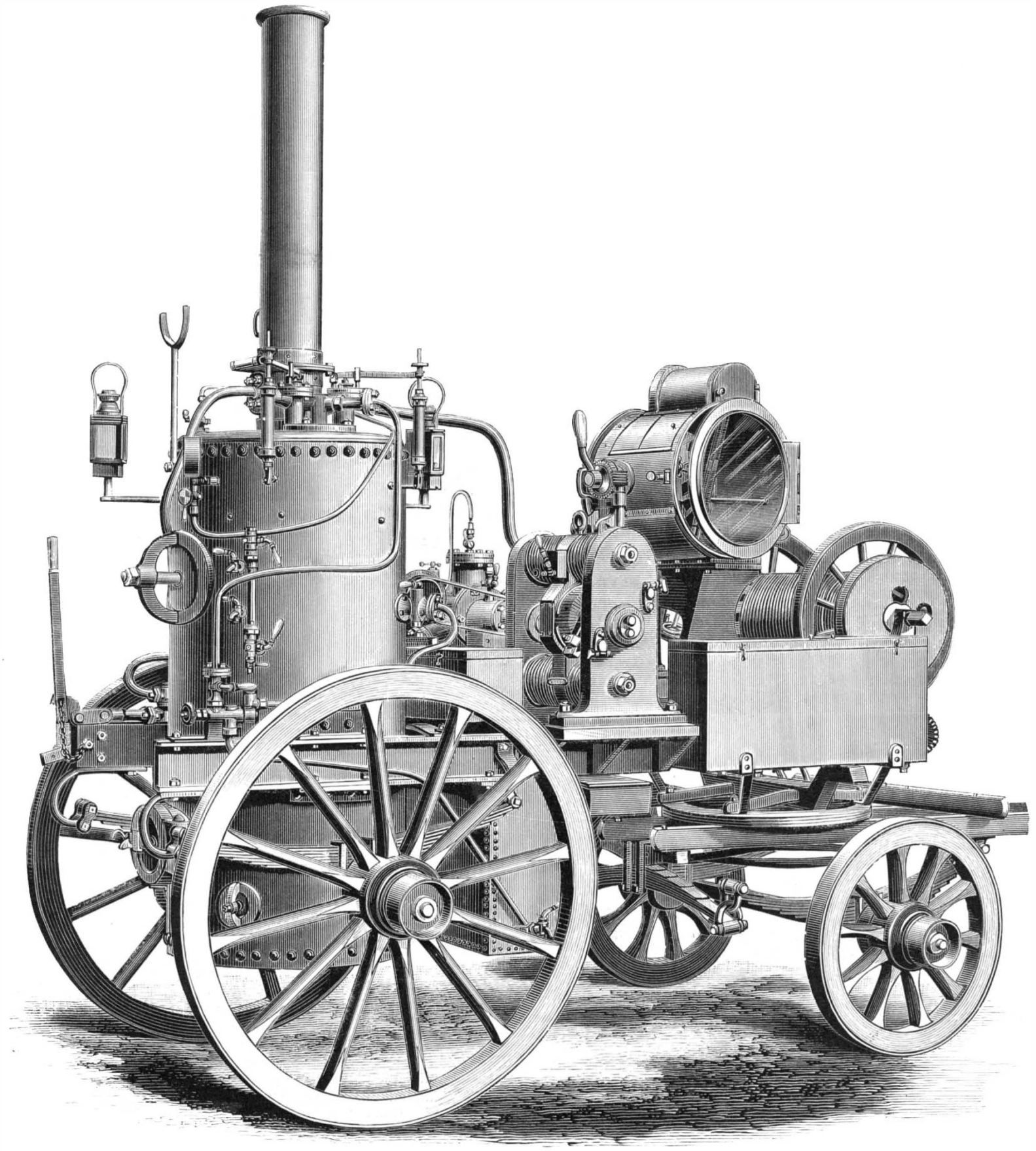
ELECTRIC LIGHTING FOR SIEGE PURPOSES.

It is extremely useful for the defenders of besieged places to be able at night to illuminate the accesses to the fort, since the enemy generally profits by darkness to undertake his sapping operations and to effect those movements of troops that are necessary to make an assault or attempt a surprise. So, from all epochs, the endeavor has been made to illuminate the country by throwing projectiles composed of materials that are inflammable but of slow combustion. Sometimes these projectiles were held aloft by means of a parachute with which they were provided, and which unfolded itself after a certain length of time; and, sometimes, they were allowed simply to drop on the ground. But, in the latter case, the assailants among whom they fell naturally hastened to extinguish them or to roll them into some ditch. This is the reason that the fire bombs employed at the present day by the artillery are provided internally with a grenade designed to explode at the moment combustion is about ended and to wound or kill soldiers who approach it. The imperfections of such a process will be readily understood. The projectile, being very light, cannot be shot to any very great distance, and the light that it emits is quite rapidly extinguished after lighting up an extent of ground which, at the best, is comparatively small. For this reason, an effort has been made for several years past to utilize for the purpose the electric light, and to form therewith a powerful luminous fascicle capable of being directed at will to different points in such a way as to sweep the entire surface of a sector. Parisians will recall the installation made at the Moulin de la Galette of an apparatus of this nature, which was illustrated in all the journals of that epoch (winter of 1870–1871).

Unfortunately this invention, in all its novelty, did not yield very great results, for the illuminating power was insufficient, the range of the luminous fascicle was too limited, and the mechanism employed was too cumbersome and costly. If these first arrangements had been retained, it would have been necessary to adopt a small number of stations and to make them permanent.

In order to make an application of electric lighting for the defense of our fortresses (and, as well known, France possesses, and is at present constructing, numerous intrenched camps, forts, etc.), it became necessary to effect great improvements in the machines employed. The economical aspect of the question had to be taken into consideration, and there had to be obtained also a sufficient portability in the sources of electricity and light to make up for the numerical lack of *matériel*, and to allow of the range of illumination being increased by displacements of the machine or of the lamp.

The use of the Gramme machine has permitted the carriage for carrying the apparatus to be made considerably lighter. In outer forts, and even for the needs of a campaign, a single carriage carries both the generator of electricity and the



PORTABLE ELECTRIC LIGHTING FOR SIEGE PURPOSES.

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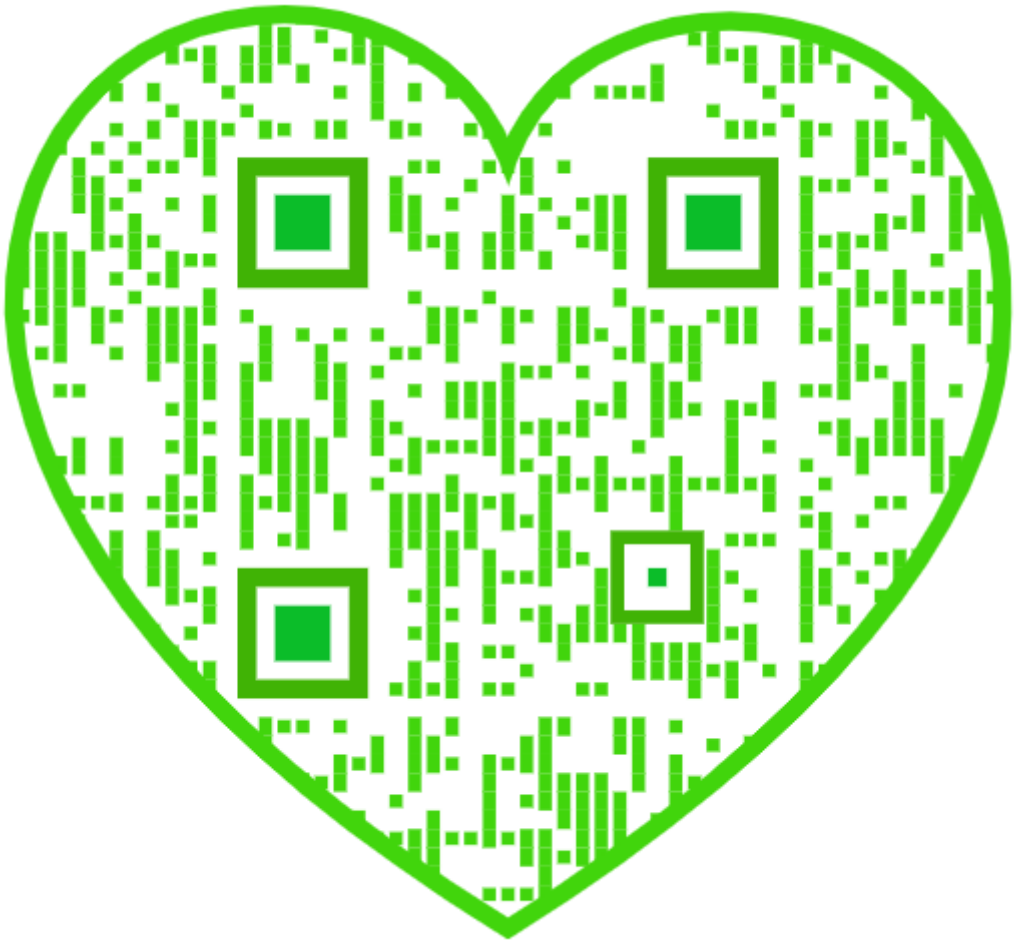

lamp. The latter is not fastened to the carriage, and can be removed by a couple of men and carried to any culminating point in the vicinity, while the vehicle remains where it is. The projecting apparatus is set up on a folding support which opens and closes in the form of a sort of lattice work.

The engraving given herewith represents the type adopted for the French army, which at present possesses light apparatus of the kind. One of the apparatus was shown at the recent exhibition of electricity by the Minister of War, and another by the house of Sautter & Lemonnier.

The projector, which was devised by Colonel Mangin of the French army, is 40 centimeters in diameter. The Gramme machine gives a light equal to 600 Carcel burners. The apparatus thus arranged permits of the exploration of the country to a distance of 2,400 meters, and even of three kilometers if the weather is sufficiently clear.

There was also exhibited at the Palais de l'Industrie another type designed for forts of the first category, but on the same system. This was experimented with for a long time at Mont-Valerien, and it was found that an observer standing alongside of the apparatus could see objects located at a distance of more than six kilometers, and distinguish details of construction at five kilometers. With so great a power as this, it is naturally necessary to employ less portable machines than those above mentioned, and the projecting apparatus and the generator of electricity have to be carried on separate carriages.

We shall now briefly point out the peculiarities of these two essential parts.

What constitutes the originality of the Mangin projectors is the form of the mirror. It is well known that in order to reflect the rays diverging from a lamp into a fascicle of parallel rays, it is only necessary to place the lamp in the focus of a parabolic mirror. Now the construction of parabolic curves is difficult and expensive, so Col. Mangin conceived the idea of employing glass cut with two spherical surfaces, thus facilitating the labor. These two spheres must not be concentric; and calculation permits of finding the degree of eccentricity with which the ray, emanating from one of the centers, is sufficiently parallel in practice (though not geometrically so) with the diameter which joins the two centers to give the fascicle all the power desirable. It is easy to verify the fact that the convex surface has a greater radius than the internal cavity; or, in other terms, that the thickness of the metal in the center is less than at the edges.

A biconvex lens, interposed between the luminous focus and the reflector, diminishes the focal distance, and, consequently, permits of reducing the dimensions of the projector.

Col. Mangin likewise employs a *dispenser*, the object of which is to spread out horizontally the fascicle obtained—height being of slight importance. It appears that this arrangement has been somewhat criticised, as it diminishes the intensity of the light produced. "The projectors being movable," say the adversaries of this system, "their field may be extended, without any loss of illuminating power, by a simple displacement."

Let us now pass on to the source of electricity.

The Gramme machine, adopted in France, Russia, and Norway, is actuated by a three-cylinder engine on the Brotherhood system. The electro-magnets are flat and very wide, and the bobbin has two current collectors. The elements may be coupled for tension or quantity by means of a commutator mounted on the machine, and the changes may be effected instantaneously.

When the electro-magnetic parts of the machine are coupled for quantity, it revolves at the rate of 600 revolutions per minute, with an expenditure of a power of four horses, the light produced varying from 1,000 to 1,200 Carcel burners. When coupled for tension, the machine revolves with a velocity of 1,200 revolutions per minute, with an expenditure of eight horse power, and gives a light equal to 2,000 to 2,500 burners. With such a power, and by the use of projectors 90 centimeters in diameter, ordinary writing may be read at a mile distant, as has been shown by experiments made at Berlin in 1875. By placing in front of the regulator a mirror inclined toward the horizon it has been found possible to project on the clouds a luminous band which, from a distance, looked like the tail of a comet, and on which (as on the screen exposed before a lantern) exhibited themselves such signals as were made in front of the mirror.

There is thus realized, then, a system of optical telegraphy in which the Morse alphabet is employed as a means of correspondence.—*Revue Industrielle.*

Verdict of the Coroner's Jury, Jewells' Mills Explosion, Brooklyn, N. Y.

"We find that Levi J. Stevens came to his death on the 16th day of February, 1882, by the explosion of two boilers belonging to the Jewell Milling Company. We believe and find that the sole responsibility for said explosion rests upon the Hartford Boiler Insurance Company; and we hold said company responsible for the death of Levi J. Stevens, in giving permission to the Milling Company to carry an amount of steam which the age of the said boilers did not warrant, and which, in the jury's estimation, said boilers were unable to carry. We are of the opinion, and recommend, that boilers be tested in the future by both the hammer and hydrostatic test."

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PROPOSED AMENDMENTS OF THE PATENT LAWS.

Elsewhere will be found the text of a bill (H. R. 4,949), introduced in the House of Representatives, March 6, by Mr. Morgan R. Wise. Most of its features are highly commendable.

The first clause aims to prevent fraud upon "innocent purchasers of patent rights" by making it the duty of intending purchasers of such rights to take reasonable precautions against being cheated; such precautions as any intelligent business man would be sure to take, or would regard himself foolishly careless if he did not take.

This clause strikes at the root of much of the complaints against the patent system. Men who stupidly or with criminal intent purchase alleged patent rights without investigation should blame themselves and not the Patent Office when their ventures prove unprofitable. They have no right to pose as innocent victims of the law, or to besiege Congress for relief from their folly at the cost of honest inventors and patentees.

The latter part of the section provides a fine not exceeding $1,000, or imprisonment not exceeding three months, or both, for fraud in the selling of patent rights by the use of forged or altered patent specifications, claims, or drawings.

The second section of the bill provides corresponding penalties for fraudulent patent sales, wherein the seller pretends to convey rights or privileges which have previously been disposed of, wholly or in part, to others.

Section 3 is designed to facilitate the work of the Patent Office, and enable it to comply with the terms of the law without antedating or reallowing patents the final fees for which are paid at the end of the six months' limit.

Section 4 makes it possible for the owner of a properly assigned patent to obtain a reissue without the signature of the inventor, who has ceased to be a party in interest.

Section 5 makes the life of an American patent absolute, and not as now contingent upon the life of any foreign patent upon the same matter which the inventor or another may have taken out. This is a proper and very desirable provision.

Section 6 contains two provisions, both commendable. The first is that a reissued patent shall not cover any machine or article the production of which was begun during the existence of the original patent, but not subject to it. When an inventor omits to claim what he might properly have claimed in a patent, it is fair that he be allowed to correct the oversight within a reasonable period; but it is not fair to allow him to make the correction the means of dispossessing or restraining another in an industry lawfully begun. The latter part of the section provides that the surrender of a patent for reissue shall not cause any forfeiture of rights which had accrued under the patent previous to its surrender.

Of the forepart of section 7 we cannot speak so favorably. It fixes a price for the *Patent Office Gazette* to American subscribers very much lower than its actual cost, and provides a higher rate for foreign subscribers. The office would receive no benefit from this discrimination, for the simple reason that the foreigner would buy through an American agent. The purpose of the diminished price is to diffuse mechanical knowledge and encourage invention. The diffusion of knowledge is no part of the function of the Patent Office; the encouragement of invention is; but the method prescribed by the Constitution for the carrying on of this desirable work does not include the publication at a loss of *Official Gazettes* or any other literature, however valuable or useful.

The proposed reduction in the price of copies of patent specifications, claims, drawings, and related matter seems to be entirely reasonable. If incorporated into the patent laws the first section of the bill would create a largely increased demand for such papers, and the prices named would appear to be ample to cover cost.

The sections of the revised statutes which section 8 would repeal relate chiefly to the extension of patents granted prior to March 2, 1861—sections which expire by natural limitation this year.

The provisions of this bill, with the single exception noted, are so well calculated to "amend" the patent laws in the best sense of the word, that its early passage is much to be desired.

In place of the objectionable portion of section 7, we should be glad to see a clause making it the duty of the Commissioner of Patents to provide in the Patent Office better facilities for an examination of its records. The records are intended to be, and to a great extent are, open to public inspection; but in the absence of special provision for such work it is practically impossible for an inventor, an intending purchaser of patent rights, a manufacturer, a student of any department of invention, or other citizen, to make an examination of the records of the office that he can be sure is complete and thorough.

What is needed is a room or rooms set apart for the purpose indicated—a place where the searcher could have brought to him for examination copies of every record relating to the subject he is investigating; a room provided with complete indexes of all the records of the office, in charge of attendants able to aid and advise the searcher, as a competent librarian aids the searcher for special information in a great library.

Something of this nature would be of great public utility, and the need of it must increase with time and the rapidly accumulating records of the office. The patents in many departments are now so numerous that even at the low price

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fixed for them in the bill in hand, few inventors could afford to buy them all, and if they could it would in many cases be much more advantageous to search the records on the spot.

THE CHINESE CRAZE.

The civilized but sadly unenlightened world is just now grievously afflicted with crazes, due, let us hope, to the culmination of the period of sun spots, and, like the solar disturbances, likely soon to wane and leave the world sane again.

One, perhaps the worst, symptom of the malady shows itself in malignant attacks by the noble Caucasian upon so-called inferior races, because of their unwarranted successes in the struggle for wealth and position. In Europe the terrible Shemite is the victim. The Jew is essentially bad, and a peril to Christian civilization, because he is industrious, thrifty, prudent in business, and determined to get on in the world. He wickedly amasses wealth, crowds himself into high places in the professions, in art, in literature, and threatens to make himself the political as well as the financial master of Europe. So the noble Caucasian cries "down with him!" and, where circumstances favor, proceeds to put him down by mobbing him, destroying his property, and outraging his wife and children.

On this side the Atlantic the anti-Shemitic mania afflicts but few; but the anti-Mongolian mania threatens to be general. Already it has raged in Congress to a degree calculated to humiliate all sane Americans now and for years to come. The picture which Congressmen draw of the certain submergence of Christian civilization in this country by swarming hordes of heathen Chinese is so appalling that Congress threatens to pass a law to prevent it by stopping immigration from that side of the world; thereby adopting toward the Chinese the same policy of exclusion which the Chinese so long exercised against the "outside barbarians." Having compelled China to open her ports and allow Americans to go thither to trade and to upset by missionary operations the social and religious order of the empire, the superior race now finds itself in the position of the fisherman in the Arabian Nights after he had forced the cork of the magically sealed bottle and would fain have the genie shut himself up again. The case would be pitiful if it did not originate in craze and lead to national dishonor.

The reasons for abusing and excluding the Chinese are curiously like those given in Europe for similarly treating the Jews. At first it was said that they were poor, and filthy, and ignorant; that they were religiously perverse; that they were incapable of becoming good citizens; that they did not, or would not, or could not "blend" socially and vitally with the superior Caucasian. Now their great fault is that they will not keep down; that they actually aspire to dominate; and that when suffered to compete with their superiors, they show a capacity to come to the front that is positively alarming. The following from the San Francisco *Alta* illustrates this phase of the subject with curious felicity. Changing "Chinaman" to "Hebrew," it might be mistaken for a literal translation of recent French, German, or Russian utterances arising from the peculiar though kindred race mania prevailing in Europe. The *Alta* says:

"Wherever a Chinaman gains a foothold there he stays. If, for instance, our lumbermen were to adopt that class of labor, they would exclude other competition, and finally find themselves dependent upon the heathen Chinese. What that dependence means, all who have experienced it know. It means the supremacy of Chinese over Americans. When the Chinaman runs out an American, it is only a question of time when the Chinese capitalist shall run out the American capitalist. His money is cheaper, as the labor of his countrymen is cheaper. In every employment they have entered the Chinese have mastered their work. They are the best imitators in the world. The man who belittles or minimizes a Chinaman is a fool. The Chinese are dangerous because they are adepts. In all the arts aud sciences we find them rapidly catching up with modern progress. They are reaching out everywhere. It was but recently that the advent of a Chinese ship created commotion on the Thames. It will create more commotion before they are done with it. The Chinese go to stay. A few rebuffs do not dishearten them. Knowing their capacity to underlive and undersell their competitors, they are tenacious in the extreme. They don't know any such word as fail.

"If the Chinese were intellectually inferior to Caucasians the danger would be less. But they are not. In commerce especially they are the keenest, wisest, and most forehanded people in the world. Besides, they live cheaper and can afford to undersell us. Merchants of San Francisco, take this point into your consideration and digest it. You cannot, if you would, evade it. It is a foregone conclusion that every trade the Chinese are admitted into they will finally control. And when Chinese laborers or operatives have displaced Americans, it is simply a little while until Chinese capitalists give their American compeers 'the grand bounce.' They get money cheaper; they live cheaper; how can you compete with them? It can't be done. Our only resource lies in exclusion. We do not sow our fields with thistles, neither should we permit noxious weeds to overspread our commercial garden.

"Merchants of San Francisco, you have a great and pressing duty to perform. Your self-preservation demands Chinese exclusion. See to it that you exclude them in time. Else, you shall ultimately find your investments unprofitable, your business withering, and your occupation gone. With a full knowledge of the probable effects, we sound this note of warning to American capitalists. They cannot compete with the cheaper capital of China."

"Bill Nye" was a true prophet; and to be consistent, before the craze passes, Congress ought to pass a resolution to the following effect:

"*Resolved:* America is the home of the Free and the land of the Brave. We are the Smartest people in the world. Our national doors are opened wide; but all immigrants must come under bond that they will not try to compete with Us."

On the Estimation of Small Traces of Gold.

BY NELSON H. DARTON.

It is of considerable interest to geologists, as well as prospectors, to note the rocks containing mere traces of gold; and as they are very abundant even in this State, we often meet with them. There is a porous gneiss at Inwood, New York City, containing appreciable amounts of gold, sintered down from elevations in the north as placer deposits of very weak intensity, and become fixed in the rock. This origin is clearly shown, as there was a very gentle slope through the State, and the amount of gold, probably limited to commence with, was thus widely disseminated over this incline and there fixed by deposits above it, and came into intimate contact with the rock by infiltrating waters taking it into solution and depositing it through the mass. Fissures and basins occurring in several of the counties in northern Central New York intercepted and concentrated parts in its downward movement of the richer portion of ore, and thus gave in places the rich indications and yields. But to return to the subject.

There have been a number of methods proposed to detect the minute quantities of gold occurring in the rocks mentioned above, and in ore tailings, etc.; and having examined and tested every method I have known to have been suggested, I have come to the conclusion that the one noticed below yields by far the most satisfactory results if the details are well carried out, and is the most practicable in the field or in the laboratory. I know of no compound which would be formed from natural products by the method which would mislead by staining the ash a color at all similar to the distinctive purple of finely divided gold.

Small parts are chipped from all the sides of a mass of rock, amounting in all to about a quarter of an ounce. This is finely powdered in a steel mortar and well mixed. About half of it is placed in a capacious test tube, and then partly filled with a solution made by dissolving twenty grains of iodine and thirty grains of iodide of potassium in about an ounce and a half of water. The mixture thus formed is thoroughly agitated by shaking and warming, and then, after all particles have subsided, dip a piece of pure white filter paper in it, allow it to remain for a moment, then let it drain, and dry it over the spirit lamp. It is then placed upon a piece of platina foil held in a pincers, and this heated to redness over the flame; the paper is speedily consumed; and after heating further to burn off all carbon, it is allowed to cool, and then examined. If at all purple, gold is present in the ore, and the relative amount approximately deduced, as much, fair, little, or none. This method takes but little time and is very trustworthy.

New Method of Purifying Copper.

Successful experiments, described in the December number of the *Comptes Rendus*, have recently been made by M. J. Garnier, at the works of Messrs. Laveissière et Fils, Dèville, near Rouen, with the purpose of removing arsenic and antimony in the commercial copper. From a theoretical standpoint the method now generally employed might be more satisfactory. The refining hearth is covered with silica, supposed to absorb the arsenic and antimony which are oxidized during the process, and to make them go into the slag. In reality this combination is formed very imperfectly, and an amount of two one-thousandth of arsenic is considered sufficient to impair the quality of the copper. M. Garnier's process in some respects resembles the Thomas-Gilchrist process. He employs a sole of chalk and tar, over which, for each separate operation, he places a false sole of limestone and manganese peroxide. With the melting of the copper a generation of carbonic acid and oxygen begins from the upper sole, which oxidizes the charge. As soon as the metal is sufficiently liquid the lime and manganese protoxide rise and dissolve the arsenic acid. By this one operation the amount of arsenic, according to M. Garnier, is reduced to one-fifth. Subsequent fusions with basic fluxes are said almost completely to eliminate the arsenic. An analysis of a cement copper of Rio Tinto is added. Of 0·8 per cent of arsenic only 0·023 could be determined at the end of the third operation, the amount of iron contained being at the same time all but removed. No mention is made in this analysis of antimony. As special advantages of this system M. Garnier claims that the roasting of the black copper becomes unnecessary, and that the loss of copper, arising from parts of the copper combining with the silica of the slag, is avoided.

Improvement in Zincography.

The following is the ingenious method adopted by Captain Biny: A zinc plate, about half a millimeter in thickness (or more, if desired) is coated with bitumen, and exposed to the light under a negative plate. After being sufficiently exposed, it is treated with a solution which removes all the bitumen that has not been rendered insoluble by the action of light. We have thus an image formed of lines in bitumen on a zinc plate. This plate is next brushed over with gum, and then rolled up with an inked roller, as if an impression in zinco-lithography was to be taken from it. No impression, however, is taken; the only object of inking the plate is to better protect the lines, and insulate them more perfectly when the plate is coppered. Before coppering, the plate is dipped in water acidulated with three per cent of nitric acid, and it is then well washed in pure water. Next it is placed in a bath of the double cyanide of copper and potassium, and left there for ten to twenty minutes, when copper will be at once deposited on it. It is then washed again in water, dried, and placed in a vessel containing pure benzine; this substance dissolves the fatty ink and the bitumen which form the image, and the lines of the picture will be seen to appear in zinc on a copper ground. After again washing the plate very copiously, it is then immersed in water acidulated with three per cent of nitric acid, in order to produce a slight etching of the surface. In this bath it is left for about a minute, keeping the liquid agitated, and passing a brush along the lines of the zinc so as to clear them. The acid in the bath being highly diluted, it acts very feebly on the copper, but on the zinc its action is much more energetic, so much so as at the end of a minute to produce very marked depressions. When the etching is completed, the plate is again washed, and dried at a gentle heat. A varnish of six or eight per cent of bitumen dissolved in benzine is then passed over it, and when this is dry, the plate is transferred to a stone or to a sheet of metal which has been coated evenly by means of the roller with a layer of fine lithographic ink. The squeegee is then passed lightly over the back of the zinc plate, and it will be found that all the projections have been blackened by the ink wherever they have come into contact with the stone, while the lines constituting the drawing are free from ink altogether. This black layer which covers the bitumenized surface is intended to form a screen against the action of the light, and when the whole plate is now exposed, only the direct rays act upon the bitumen of the lines which is not protected by the blackened surface. To complete the plate, it is now only necessary to lay it on a level table, with the prepared surface upwards; it is rubbed over with a metal cube, first interposing a piece of blotting paper dipped in spirit of turpentine. In this way the whole surface is cleaned, and the zinc of the ground alone appears, while the lines covered with bitumen have not been touched, and we have a plate for which a large number of impressions may be taken almost equal to copperplate, although produced in a lithographic press. By electro-depositing a layer of copper on a sufficiently thick plate of zinc, and then submitting it to prolonged etching, lines of considerable depth may be obtained; the image may be taken on the copper surface either by means of bitumen, or by means of bichromated gelatine or gum—as in the Gobert process—and we have an engraving in copper, the cost of which has been much reduced owing to the foundation being of zinc.—*Leon Vidal, in Photo News.*

The Eads Interoceanic Ship Railway.

The Senate Committee on Commerce reported favorably, March 4, a bill to incorporate the Interoceanic Ship Railway Company. The bill provides for a guarantee by the United States of a dividend of 6 per cent per annum for fifteen years on $50,000,000 of the capital stock of this company —the total capital stock being $75,000,000—and stipulates that, in return for this assistance, the company shall transport gratis for ninety-nine years the mails, war vessels, and all other property of the United States, and shall transport American merchant vessels for one-half the rates charged by the company on all other commerce except that of Mexico. It is further provided that for any advances made by our government under its guarantee the company is to give its bonds, payable in fifteen years, without interest, which bonds, in the event of their non-payment at maturity, are to be receivable for tolls on any American vessel, with ten per cent added to their face value.

The guarantee is to attach to the extent of $5,000,000, when ten miles of the ship railway, and the terminal works connected therewith, shall have been completed and tested in the presence of government engineers, by the safe transportation of a loaded ship, weighing 2,500 tons, from the harbor to the terminus of the said ten mile section and back again, at an average speed of six miles per hour.

Another $5,000,000 is to be guaranteed when another ten-mile section, with the necessary terminal works, shall have been completed and tested in the same manner as the other end of the railway. A commission of engineers, appointed by the President of the United States, is then to examine the intermediate portion of the route, and report whether or not the completion of the ship railway over it is entirely practicable at a cost not exceeding $60,000,000. If the commission reports in the affirmative, the government guarantee is to attach for the remaining $40,000,000 of the $50,000,000 of stock to be guaranteed in accordance with the successive completion of the intermediate sections of the line. If the commission, however, reports in the negative, the bill provides that no further guarantee shall attach until a loaded ship, weighing 4,000 tons, shall have been safely transported over the entire line from ocean to ocean.

THE TELEGRAPH IN CHINA.—To induce the people to make themselves familiar with the operation and utility of the telegraph, the Chinese authorities have shrewdly made the use of the new lines free for the space of one month.

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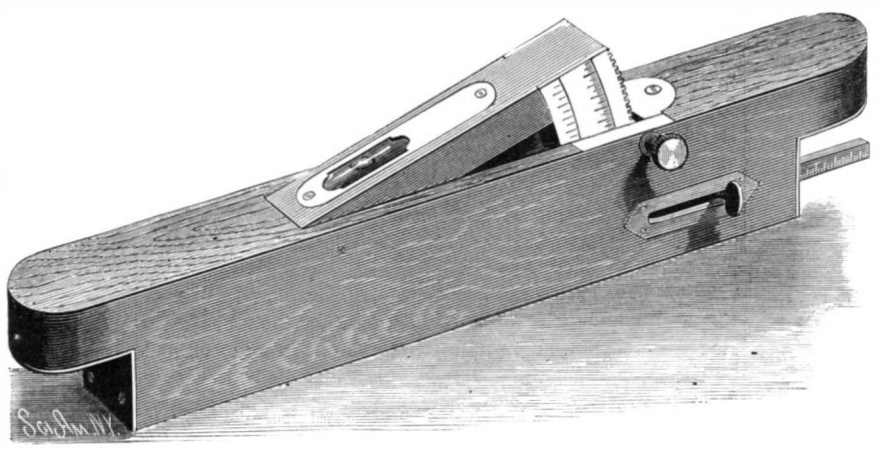
NEW RAILWAY TRACK GAUGE AND LEVEL.

This implement consists of a stock having shoulders which rest upon and fit between the rails. An extended chamber in the top contains a swinging bar, pivoted at one end, and having at the other end a curved rack which is engaged by a pinion on a spindle extending through the stock. The swinging bar contains an ordinary level, and is graduated on its curved end so as to indicate the amount of difference in the horizontal planes of the inner and outer rails of a curve. When a curve of short radius is to be made, the distance between the rails is slightly increased. The required increased length of the stock is secured by pushing out the sliding bar in one end of the stock.

In using the instrument the stock is laid transversely between the rails, its shoulders fitting upon the rails. When the track is in a straight direction the level in the bar will level it. When the track is to be curved, the degree of curvature having been first determined upon by the direction or curve of the road, the object then is to determine the difference in the horizontal planes of the two rails—that is, how much one must be raised above the other. It is a matter of calculation that when a curve of certain degree is made, one rail should be raised above the other a certain distance. The scale of degrees and the scale of inches upon the swinging bar are made to so correspond that when a certain degree appears above the edge of the stock when the bar is raised, a certain inch line will also appear, and that line is the exact distance the rail must be raised when a curve of this degree is to be made in the track.

This invention was lately patented by Mr. Charles F. Bergh, of Alma, Cal.



BERGH'S RAILWAY TRACK GAUGE AND LEVEL.

Clearing a Tunnel of Smoke.

Good report is given of the great fan lately constructed for the ventilation of the railroad tunnel between the St. Louis bridge and the Union Depot. It is said that the tunnel can be cleared of the smoke of the heaviest freight train in three minutes; and that when no trains are passing the air is as fresh and clear as that outside.

Postal Parcels in France.

Since May 1, 1881, as the result of a convention between the French Minister of Posts and Telegraphs and the administrations of the various railways in France, parcels not exceeding 3 kilogrammes (6½ pounds) in weight, and subject to certain limits of dimensions, are conveyed between any two points of French territory for 60 centimes (6d.), if called for at the station, and for 85 centimes (8½d.) if delivered. These rates include the duty of 10 centimes (1d.) levied by the government.

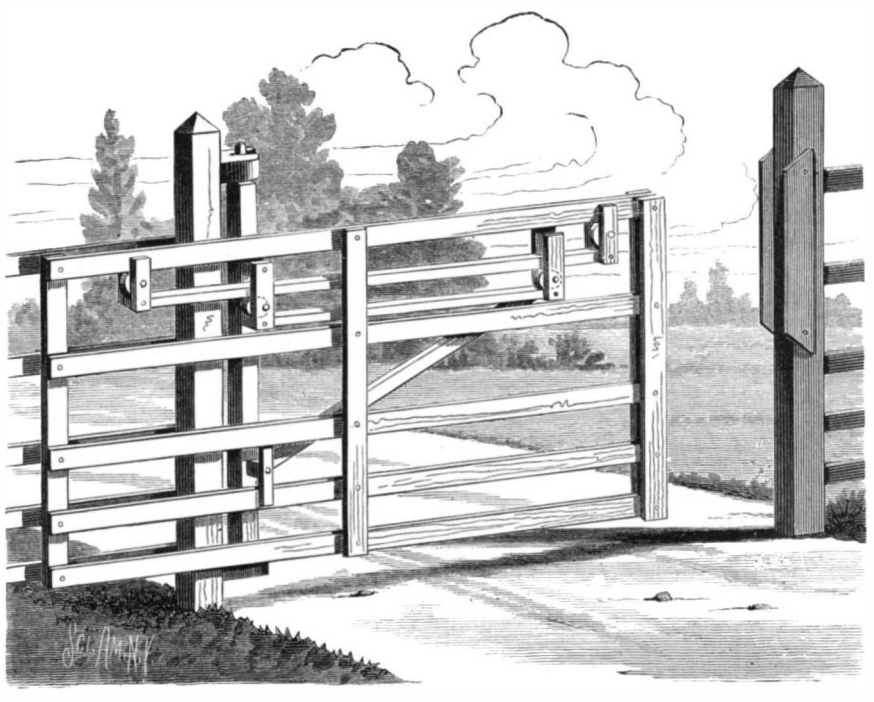
IMPROVED GATE.

The engraving shows an improvement in gates, more particularly applicable to farm gates or other large gates. The gate is formed of horizontal and vertical bars in the usual way. A crane or bracket, consisting of a vertical pivoted post, a horizontal bar, and a diagonal brace form the support and pivot of the gate. On the pivoted post, and on the free end of the horizontal bar, there are rollers that turn between vertical guides and support a movable horizontal bar, having at its ends rollers turning between vertical guides. The upper rail of the gate moves on these last-mentioned rollers, and the movable horizontal bar moves upon the rollers carried by the crane.

A button on the vertical pivoted post engages one of the lower rails of the gate and prevents the gate from swinging out of place. By turning this button the gate may be swung out of the vertical position and lifted off from its roller support, and its second rail may be allowed to rest upon the upper set of rollers. The button will then be placed in position to confine the lower rail, and there will be sufficient space below the gate to permit the smaller animals to pass through while retaining the larger animals. Two cleats nailed to the latch post form a groove for receiving the end of the gate when closed.

This improved gate slides easily, swings readily, and is simple and durable.

Further information may be obtained by addressing Mr. W. A. Preston, Fort Branch, Ind.



PRESTON'S IMPROVED GATE.

Electrical Progress in Vienna.

An exhibition of electricity and its various uses, after the plan of the late Paris Exhibition, will be held in Vienna during the coming summer, under the management of Count Wilczek and Baron Victor Erlanger. It will be held in the central building of the International Exhibition of 1873.

The Telephone Exchange, opened in Vienna in December last, is said to be doing well. By the middle of February there were three hundred subscribers, and connections were being made with two hundred more. The charge is 100 florins, or about $40, a year.

A very successful trial has just been made of the Brush system of electric lighting in Vienna. The Place of St. Stephen and the neighboring streets were lighted with fourteen lamps, with such excellent results that preparations are making for the electric illumination of the famous Ringstrasse, the finest avenue in the city if not in Europe. One hundred and thirty Brush lights will be required. The light will also be introduced into public and private buildings.

The Converting Power of Malt.

Now that brewers are learning to use raw grain in combination with malt, it becomes of considerable importance to be able to determine and compare the converting or diastatic powers of different samples of malt. The value of a malt may depend to a considerable extent on this property, for without it much of the starch in the raw grain will remain unacted upon. The converting agent in malt, usually called diastase, is a nitrogenous substance, but as it is accompanied by several other inert nitrogenous substances, the determination of the nitrogen in the malt gives us no exact idea of its converting power. The proper plan to adopt is to cause some of the malt to act upon an excess of starch, and then to determine the amount of sugar formed. A small quantity of the malt to be tested having been crushed is added to a very large excess of starch, previously made into a paste with warm water; the amount of starch must be in excess of what it is possible for the malt to convert; the mixture is then kept for about two hours at the temperature most favorable to the conversion of the starch, the liquid is then filtered so as to separate the starch remaining unconverted, and in the clear solution the maltose is determined by Fehling's solution. In this way, by making comparative experiments with different malts, their various converting powers may be determined with some degree of precision.—*Brewers' Guardian.*

New Attachment for Vises.

A useful attachment to vises, by which a great amount of work that is usually done with files, etc., can be easily and quickly accomplished, has been recently patented by E. E. Schermerhorn, of New York city. It consists of a milling tool or rotary cutter mounted on a suitable arbor carried by adjustable arms, by which the cutter can be placed in position to work in any direction. When attached to the bench-vise and operated by hand it may be traversed over any piece of work that can be held in the vise, being provided with a suitable feed motion for that purpose, thereby effecting a great saving in labor and files. It is also an efficient drilling machine, and very useful for cutting off metal bars, rods, etc.

The Latest Automaton.

A recent news letter from Vienna says. Two months ago an automaton called King-Fu was exhibited in Vienna for the first time, and caused a great commotion. The automaton, as also the stool upon which it was seated, were too small to admit of the possibility of any person being concealed in them. Besides, the stool was of glass, and disclosed most complicated machinery, consisting of wheels of all kinds and dimensions, and springs and chains. The machine was wound up at the beginning of each performance, and was then able to answer any question in arithmetic put to it by the spectators. The exhibitor, Herr Rosen, was offered money by members of the aristocracy to disclose his secret, but he refused point-blank. When the whole town had gone to see King-Fu, the court's curiosity was roused, and the Emperor had M. Rosen called to perform one evening before himself, the Empress, and little Princess Valerie. The automaton solved all the problems put to it, and, when the performance was over, the Empress said to Rosen: "Now you will not mind telling us the secret of your King-Fu?" But Rosen did mind. The next day he quarreled with his servant, who, being dismissed, betrayed his former master, and he told a dreadful story of a young man who was concealed within King-Fu, and who suffered horrible agonies during each performance. The police intervened, and found that there certainly was a boy (Rosen's own nephew) inside King-Fu, but that he was, all things considered, pretty comfortable, and certainly suffered no agony. The papers got wind of the affair, and Rosen announced his departure from Vienna. But justice, in the shape of the police, stopped him, and actually put him in prison on the charge that he had cheated the public out of 20,000 florins. After five days' detention M. Rosen was liberated, there being no real charge against him. The public, although duped, was entirely on M. Rosen's side. Those who believed that a machine, once wound up, could answer multitudinous questions must have believed in a miracle; and those who did not believe it must of course have tacitly acknowledged that they were being deceived in some manner. When M. Rosen complained of having spent a week in prison, he was answered that he certainly deserved some punishment for having cheated the "very highest court in Europe" into believing—what? He packed King Fu up, and left Vienna with his 20,000 florins, his nephew, and his automaton.

A Dog Goes Over Niagara Falls Alive.

A large dog lately survived the passage over Niagara Falls and through the rapids to the whirlpool. He was first noticed while he was within the influence of the upper rapids. As he whirled rapidly down over the falls no one imagined but that that was the last of him. Shortly afterward, however, he was discovered in the gorge below the falls vainly endeavoring to clamber up upon some of the *débris* from the remains of the great ice bridge which recently covered the water at this point, but which had nearly all gone down the river. The news spread rapidly through the village, and a large crowd gathered on the shore. Strenuous efforts were made to get the struggling animal on shore, for an animal which had gone safely over the falls would be a prize worth having, but without success. Finally the dog succeeded in getting upon a large cake of ice and floated off upon it down toward Suspension Bridge and the terrible whirlpool rapids. Information of the dog's coming was telephoned to Suspension Bridge village, and a large crowd collected on the bridge to watch for the coming wonder. In due time the poor fellow appeared upon his ice cake, howling dismally the while, as if he appreciated the terrors of his situation. An express train crossing the bridge at the time stopped in order to let the passengers witness the unusual spectacle. Round and round whirled the cake, in a dizzy way, and louder and more prolonged grew the howls of the poor dog. As the influence of the whirlpool rapids began to be felt, the cake increased in speed, whirled suddenly into the air, broke in two, and the dog disappeared from view. No one thought that he could possibly survive the wild rush through the rapids. When, therefore, word was received that the dog was in the whirlpool, still living, and once more struggling vainly to swim to land, it was received, however, with marked incredulity. This story was substantiated by several trustworthy witnesses. It seems incredible that an animal could go through the upper rapids, over the falls, through the gorge, through the whirlpool rapids, and into the whirlpool itself, a distance of several miles, and still be alive. The poor animal perished in the whirlpool.

ROSE CULTURE.—The Kezanlik Valley, in Roumania, is entirely given up to the cultivation of roses. The essence is sold wholesale in Paris from £30 to £40 per pound, while it is retailed at £100 or more per pound.

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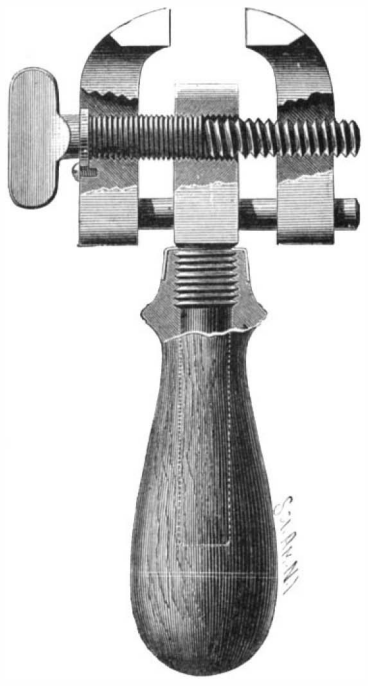
NEW HAND VISE.

The engraving shows a vise having jaws which are movable toward or from each other by means of a differential screw provided with threads of unequal pitch, the jaws being guided in their movement by a bar fixed to one of the jaws and movable in a stock and the shank of the opposite jaw. By this arrangement the opening between the jaws is always in a central position. By removing the vise from the handle it may be used in a lathe as a chuck for holding drills and other small articles, each jaw being traversed by a V-shaped



BUTLER'S IMPROVED HAND VISE.

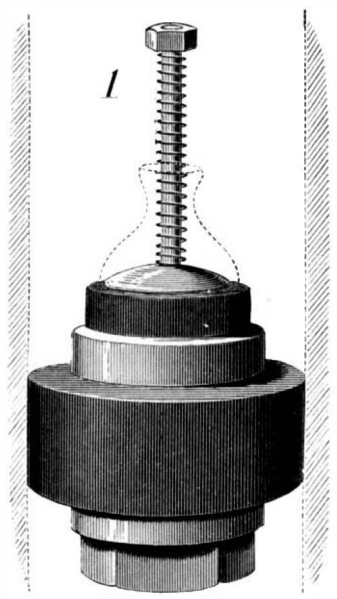
groove for receiving a drill or other tool, or for holding a pin to be filed.

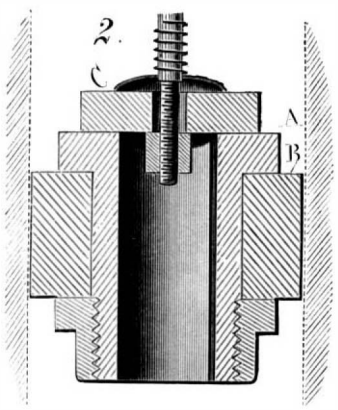
This invention was recently patented by Mr. C. L. Butler, of Greenfield, Mass.

IMPROVED PUMP PISTON.

The engraving shows a new pump piston recently patented by Mr. Godfrey Miller, of Anita, Iowa. The body of the piston is a tubular casting having a flange, A, formed on its upper end and a collar corresponding in size to the flange screwed on its lower end. Between the screw collar and the flange there is a packing, B, ring of rubber or other elastic packing material, which is held in place by the collar and flange, and may be compressed endwise and expanded laterally by screwing up the collar.

A circular valve, C, of rubber is placed on the top of the piston head, and is apertured centrally so that it may move freely up and down on the piston rod. A washer rests on the valve and is pressed downward by a spiral spring surrounding the piston rod. The lower end of the piston rod screws into a crossbar in the body of the piston. In some cases the material of the valve is extended upward and formed into a spring which holds the valve to its seat.





MILLER'S PUMP PISTON.

This piston is easily expanded to compensate for wear, and is readily kept tight without undue friction. Any amount of pressure may be sustained by the piston without affecting the packing or increasing the friction. Both valve and piston are constructed so that they will remain tight and retain the water in the pump barrel. The addition of the spring to assist in closing the valve insures the retention of the greatest possible amount of water above the piston.

This piston is applicable to pumps of every description, but it is especially desirable for deep wells.

New System of Grain Transfer at Chicago.

The Chicago and Western Indiana Railroad Company are developing at the South Englewood Suburb of Chicago a new plan for transferring grain from the Western to the Eastern roads. An immense transfer house, one thousand feet long, is to be built. The loaded cars from the West will be run into the house on a track twenty-three feet above the ground; and then with elevator shovels the grain will be unloaded into hopper scales holding a car load each, thus accurately ascertaining the weight of each car load. The grain will then be spouted into an Eastern car standing on the track below. The grain will be inspected at the yards, and the loaded Eastern cars made up into trains and started Eastward. The transfer thus made is quick and cheap, and the weighing accurate. The new house is expected to have the capacity of transferring five hundred car loads per day.

ENGINEERING INVENTIONS.

Mr. William G. Mills, of Merced, Cal., has patented an improved car-coupling, which consists of a draw-head having pivoted within it diagonally, on vertical pins, two opposite spring-actuated jaws for holding the coupling-pin. The rounded ends of said jaws are held in contact with each other centrally in the draw-head, and their outward extending ends are pivoted to the opposite ends of a knuckle-bar that is set horizontally and transversely across the top of the draw-head, and serves to lock the jaws in position.

Mr. Robert H. Dowling, of Newark, Ohio, has patented an improved car-coupling having a draw-head provided with a segmental aperture extending from top to bottom, and adapted to receive a segmental coupling-pin attached to an arm swinging on a pintle in the center of the circle of the segmental aperture, which arm is provided with top and bottom extensions. A guide-frame provided with elongated side loops and crank handles is loosely mounted on the ends of the transverse pintle, and is used to raise and guide the link.

A new feed-water heater and purifier, patented by Mr. Charles H. Shields, of Maywood, Ill., consists of a drum into which the feed-water is forced by pump or injector, which drum is connected with one end of the boiler by a check-valved pipe, through which steam and water pass from boiler to drum to heat the feed-water and cause a deposit of the sediment in the drum, and is connected with the other end of the boiler by a valved pipe through which the heated feed-water from the drum enters the boiler.

Mr. William O. Crocker, of Turner's Falls, Mass., has patented an improvement in turbine water-wheels, the object of which is to increase the capacity, speed, and efficiency of turbine water-wheels of the kind that receive the water on the outer side through perpendicular chutes, and discharge the water in a downward direction below the chutes. The wheel is constructed with a bell-shaped body having its largest diameter upward and its concaved surface outward, the buckets, and the bell-shaped band having its smaller diameter upward and its convexed surface inward, and having its smallest diameter equal to or a little greater than the largest diameter of the wheel-body. The wheel has other novel points which render it very efficient.

Mr. Henry Wells, of Glenwood, Iowa, has patented an improved car-coupling which consists of a flaring-mouthed curved faced draw-bar having a slotted triangular block or catch fixed centrally on its bottom within its mouth to assist in guiding and holding the coupling-link. Springs secured in the roof of the mouth assist in inclining and holding the coupling-link down and in engagement with the rear of the block or catch.

Manufacture of Oxygen Gas.

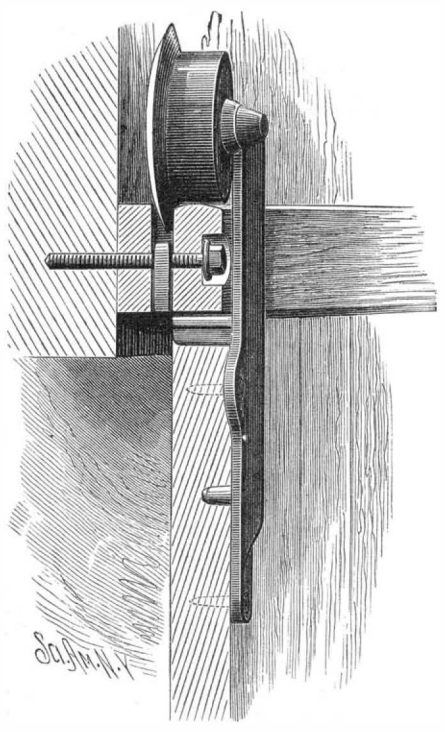
The industrial manufacture of oxygen has engaged much thought, while the uses, on a large scale, of that agent have not been very exactly determined. At Passy there are now works for producing the gas according to an improved method of MM. Brin frères, who attach the highest value to oxygen as an industrial agent, and indicate various applications of it. The process is the well-known one in which caustic baryta absorbs oxygen from the air, and gives it up under heat. By a special way of preparing the baryta, however (described in *Annales Industrielles*), they render it highly retentive of its absorbent power, obviating the necessity of frequent renewal. After four hundred operations there was (on microscopical examination) no appreciable change. The baryta is placed, at Passy, in metallic retorts connected, in groups of fifteen, in two furnaces heated with gaseous fuel. A locomotive engine drives Root blowers, which force air into the retorts; after peroxidation the oxygen is liberated by heat, and pumped into the gasometer through an apparatus which removes traces of carbonic acid. As it is found that the peroxidation takes place better with moist than with dry air, the air is passed through a saturator on its way to the retorts. For production of 5,000 cubic meters of oxygen a day in Paris, it is estimated (from the data at Passy) that the cost per cubic meter would be from 0·12 to 0·15 franc, according as coal or coke was used for fuel. The price of 100 kilogr. of baryta prepared by the new method is about 250 francs.

Pump Rod Counterbalance.

The Union shaft, on the Comstock, lately received a pump bob weighing 16 tons. It will carry, when in place, 30 tons as a counterbalance to the pump rod. The combined weight of the balance in the seven bobs at the Union shaft is 210 tons. The weight of the pump rod and water set in motion by every stroke of the engine is something over 400 tons, run at a speed of from 3 to 10 strokes per minute. Four hundred tons per stroke, 2,800 tons per minute, 168,000 per hour, and 4,032,000 tons every twenty-four hours, is the weight moved by the pumping engine at the Union shaft.

NOVEL DOOR HANGER.

The engraving shows an improved roller hanger for barn doors and other heavy doors, gates, etc. The roller of the



IDE'S DOOR HANGER.

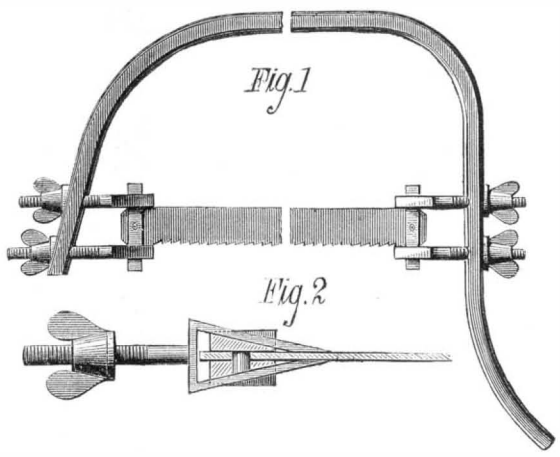
hanger has a flange beveled on both sides, which runs in the slot of the rail or track, and is capable of adapting itself to various positions while rolling on the track, without cramping or binding. The roller is pivoted in the usual way on a hanger attached to the barn door, and the outer rail upon which it runs is made slightly convex on its upper surface to permit the tread of the wheel to readily adjust itself to a good bearing. The outer rail is adjustable out and in, so that should the wooden bars forming the track become warped or sprung the track may be readily adjusted.

This form of door hanging insures the smooth running of the door, and is not liable to break should the door become loose at the bottom.

This useful improvement was recently patented by Mr. Samuel Ide, of Medina, N. Y.

NEW SAW FRAME.

We give an engraving of an improved saw frame for holding an ordinary buck-saw. The frame or bow is made of gas pipe, and the saw is clamped at each end by beveled clamping bars, two at each end of the saw, one of the bars having a pin projecting from its inner surface which passes through a hole in the saw and into a hole in the opposite bar, as shown in Fig. 2. These beveled clamping bars are inserted in the triangular eyes of bolts whose shanks extend through the bows or frame and are provided with wing nuts



BENNETT'S SAW FRAME.

which, when turned one way or the other, will tighten or loosen the saw.

By means of this device the saw is clamped securely at each end, so that it cannot twist or get out of place, and it is easily removed whenever necessary.

The frame is light, strong, and durable, and capable of being made inexpensively. It is the invention of Mr. Charles H. Bennett, of Blossburg, Pa., who may be addressed for further information.

Possible Shifting of the Course of the Lower Mississippi.

For some time a portion of the waters of the Mississippi River have escaped into the Atchafalaya River, a few miles below the mouth of the Red River. At a recent session of the House Committee on the Improvement of the Mississippi River, Capt. John B. Eads laid great stress upon the importance of closing this undesirable outlet, and predicted that if it were not closed the whole volume of the Mississippi would take that route to the sea.

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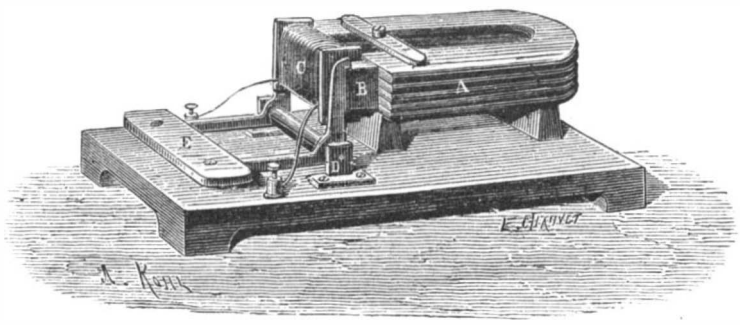
ON A NEW FORM OF MAGNETO-ELECTRIC EXPLODER.

BY MARCEL DEPREZ.

The different models of magnetic exploders that have been invented during the last thirty years present the inconvenience of being of considerable weight and size and of giving very small sparks. On seeking to arrange an apparatus of such a nature for the purpose of inflaming gaseous mixtures in gas engines, I have reached results that are much superior to those given by the models already known, both as regards weight and the intensity of the spark obtained. A few very simple theoretical considerations led me to think that if, instead of utilizing, as done up to the present time, the current directly produced on the bobbins of an electro-magnet when the latter is suddenly withdrawn from its close contact with a magnet, the current thus produced should be sent into the conducting wire of a Ruhmkorff coil —the induced wire being employed to produce the spark— the results would be better. Such a modification of the mode of operation of the apparatus carries with it certain others in its construction and in the relative sizes of the parts composing it. As the current which traverses the inducting wire of the bobbin must have a pretty great intensity, the wire wound on the electro-magnet of the exploder must be coarse; and, besides, the breaking of the inducting current produced by withdrawing the electro-magnet must take place when such current (which leaves zero to return thither in a very short space of time) passes through its maximum intensity. It was on seeking to satisfy this last-mentioned condition that I was led to invent the new interrupter for induction coils that I have described on a previous occasion. Finally, I discovered that the electro-magnets employed in the ordinary exploders contained too great a quantity of iron, and that it would be of interest to make them much smaller. These preliminaries stated, I shall now pass on to a description of the two models that I have had constructed in order to apply the principles that I have just enunciated. The first possesses a magnet weighing 1·9 kilogrammes, and the second a magnet weighing about 8 kilogrammes.



NEW MAGNETIC EXPLODER.

In the first of these models, shown in Fig. 1, the armature of soft iron, B, is connected with a rectangular frame movable around the point, D. It is formed of a piece of soft iron plate bent at its extremities at B, in such a way as to fit *very accurately* against the magnet, A, whose poles have been dressed in a polishing machine. This armature is surrounded by a coarse wire (nearly 2 millimeters in diameter) connected by electric wires to the terminals of the apparatus, which are themselves put in communication with a Ruhmkorff coil of small size.*

When it is desired to use the apparatus, a sharp blow is given to the small plate, E, and the screw of the interrupter of the induction coil is acted upon until the spark assumes a satisfactory aspect. With the small model there may be easily obtained a very hot spark of 3 millimeters in length, or a very brilliant one, destitute of an aureola, whose length may reach under favorable conditions at least 7 millimeters.

When the spring of the interrupter is given a feeble tension, two sparks may be obtained—the first at the moment of withdrawing, and the second when the armature is freely abandoned to the attraction of the pencil of magnetic rays. This latter may likewise be rendered very hot if its length be limited to about two millimeters. These two sparks develop a heat sufficiently great to set fire to a match moistened with naphtha, which is something that the sparks of the Holtz machine are incapable of doing, even when several hundred of them are directed against the moistened point.

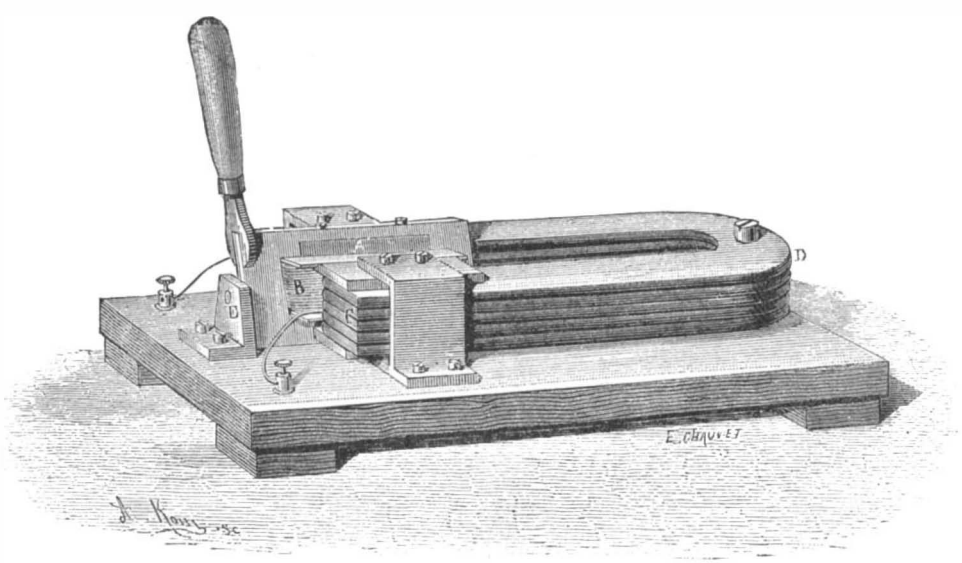
Fig. 2 represents a more powerful model of a slightly different arrangement. The armature, A, is formed of a piece of soft iron plate 6 millimeters thick and 100 millimeters long, surrounded with a coarse wire, forming a bobbin, B. The whole is firmly joined to a brass frame movable around a horizontal axis which is in a line with the axis of the magnet, C D. The latter is provided at each extremity with two pieces of soft plate iron which are beveled off at the point at which the armature, A, rests against them. There are, then, always two of these pieces in close contact with A, and two others which are not, when the apparatus is at rest. If a smart blow be given the handle, F, so as to drive it, for example, from left to right, the magnetization of the plate, A, will not only be suddenly diminished, but even reversed, since it immediately abuts against the polar pieces of contrary name to those that it touched before the withdrawal. With this arrangement, then, more energetic effects ought to be obtained than with the preceding. Nevertheless, the apparatus that I have had constructed, although having an 8 kilogramme magnet, has not given effects that were proportionally as energetic as those afforded by the small model. I have not been able to cause it to produce sparks exceeding 10 millimeters, whatever was the size of the Ruhmkorff coil employed.—*La Lumière Electrique.*

* This size is the one that gives sparks of from 8 to 10 millimeters in length.

A New Departure in Gunnery.

London papers state that the Superintendent of the Royal Gun Factories has adopted a new plan of increasing the initial velocity of projectiles. Having found by trial the description of slow-burning powder best adapted to his requirements, he has designed a contrivance for retaining the projectile in the chamber of the gun until the powder is sufficiently fired to set up a pressure of about two tons per square inch upon the base of the shot, which then starts at a bound, the speed of which is accelerated by the pursuit of the powder gases until it leaves the muzzle. The retention of the shot is accomplished by a ring of metal fixed around it near the base, and so regulated as to size that it will, when placed in the breach, be a trifle larger than the bore through which it has to pass. According to the resistance which it affords will be the period of retention. It has been demonstrated by experiments with fired gunpowder that in a very strong vessel the powder may be ignited and converted into gas, but yet held under subjection for an unlimited time. The retention ring is made of such strength that it will surrender at a given pressure, and the requisite conditions for the attainment of maximum volocities thus appear to have been realized. With the 10·4 inch gun a 462 pound shot has been fired at a muzzle velocity of 2,275 feet per second, the equivalent of which in energy is 16,500 foot tons, but as the powder charge was somewhat in excess of the service allowance it is fair to reduce this velocity by 100 feet. It will even then be far in advance of the speed attained under former conditions. The improvement has had a stronger illustration in a competitive trial between the two experimental 45 ton guns—that of Elswick manufacture, with the air-spaced chamber, and that of Woolwich, with the retention ring.

The former, with 350 pounds of powder (rather above its service charge), discharged a 700 pound projectile at a velocity of 1,900 feet per second; the latter, crammed with 400 pounds of powder and the same shot, recorded a speed of 2,120 feet. These figures represent in energy respectively 17,500 and 20,800 tons per foot, and the advantage in an attack upon armor plates may be assumed in the same proportion.



NEW MAGNETIC EXPLODER.

This improvement in gunnery, it is said, has created great satisfaction in the government departments, and great things are expected from it.

A COLORED janitor, of Philadelphia, named Joseph W. H. Cathcart, has a curious library, which may eventually prove useful to historians. For twenty-five years he has assiduously collected in scrapbooks whatever especially struck his fancy in the newspaper press, until now he has one hundred large volumes, which he regards with affectionate pride. Three of these are devoted to "China and Japan." "Incidents in the Life of Jefferson Davis" fill two volumes; "The Freedmen's Bureau" and "Slavery" claim each five volumes. One of the most interesting collections is "Poetry of the Rebellion," which contains about a thousand war songs.

Our Mines of Gold and Silver.

The following information with respect to our mines of precious metals is furnished by a special bulletin of the Census Bureau: California still holds the first place in production of gold. The vast deposits of auriferous gravel continue to yield largely, though their final exhaustion, in view of the enormous hydraulic operations now going on, must be expected at no distant day. The State furnishes 71·47 per cent of the total product of placer mines, and 51·38 per cent of the product of deep mines. The discoveries in the Bodie district added greatly to the deep mine product. The amount of silver produced is comparatively small. The gold production is $108.30 per square mile.

The decrease of the yield of the Comstock lode has caused a considerable decline in the product of Nevada. In 1876 the Comstock yielded $18,002,906 in gold and $20,570,078 in silver, but in the census year the yield of the entire Comstock district and outlying veins was only $6,922,330 for both gold and silver. The placer yield of Nevada is insignificant. No important gravel deposits having suitable water supply are known to exist.

The yield in Utah is from a comparatively few rich claims, and varies but little from year to year The placer yield was only $20,000. More than half the ore is milled, although the Territory's mining is generally regarded as dependent upon smelting works.

The development of the Tombstone district has given a marked impulse to mining to Arizona. The placer yield is only $30,000.

Since 1876 the yield in Idaho has depended largely upon the old placer mines of Boise basin. The panic of 1876, in San Francisco, seriously affected the Owhyee mines, which had contributed heavily to the annual output. The proportion of placer to deep mine gold in Idaho is as 60 to 40. The census examination was made too early to include the developments in the Wood River country and the Yankee Fork region. Mr. King predicted, when he wrote the census report, that the output of Idaho would be doubled in two years.

Mining is overshadowed in Oregon by other industries. Nearly all the deep mine gold in the State is taken from the quartz veins of Baker county.

Gold quartz mining is conducted on a small scale in Yakima county, Washington Territory, and the Upper Columbia placers furnish more than one half of the Territory's placer yield.

Alaska contains many gold-bearing districts, but the yield has been small. In the census year $5,951 in placer gold was sent to the San Francisco Mint.

Colorado had suddenly risen to the first rank as a producer of the precious metals, although as a producer of gold the State was fourth in the census year. Including lead and copper, the product was $22,750,000. The placer yield in that year was small.

The Black Hills mines furnish Dakota's yield. The placer product was about $50,000.

Two-thirds of the deep mine product of Montana is milled. The gravel deposits are valuable, and it is estimated that the placer yield is $1,162,906

The mines of New Mexico, in 1880, were awaiting the extension of railroads. Many of these mines were difficult and even dangerous of access The Census Bureau's work there was affected by the assassination of Col. Charles Potter, the expert in charge of the Territory.

There is rich placer ground in New Mexico, but for want of water but little gold has been obtained from it.

In Wyoming the actual production was confined to Sweetwater county.

The average fineness of placer gold in the United States is 0 876. Of the ore mined in the census year, 91·39 per cent in tonnage was treated at the reduction works, and 8·61 per cent was left on the dumps. The average result of the working treatment, as compared with assay value, was 81 86 per cent of the gold contents, 79·68 per cent of the silver, and 80·40 per cent in all. The highest average yield was from the Arizona ores—$7.01 gold, and $86.24 silver, per ton. Of the total gold product of the country, 64 per cent came from deep mines, and 36 per cent from hydraulic, placer, drift, and river mines.

Railway Relief Fund.

The Lehigh Valley Railroad has a relief fund from which employes draw when disabled. Each employe who desires contributes one day's work, if not getting more than $2 a day, and the company doubles the amount so raised. When the amount is exhausted a call is issued, and thus the fund is kept up. During the year ended November 30, 1881, $24,994.58 was raised, and $22,596 65 expended, leaving a balance on hand of $2,403.93. Three calls were made during the year, the number contributing to the last one being 997. The system has proved very satisfactory, and has produced excellent results.

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A New and Important Amendment to the Patent Laws.

[H. R. 4949. In the House of Representatives. March 6, 1882 Read twice, referred to the Committee on Patents, and ordered to be printed.]

Mr. Morgan R. Wise introduced the following bill: "A Bill to amend the patent laws."

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled: That to prevent the perpetration of fraud upon innocent purchasers of patent rights granted by the United States, it shall be the duty of all persons, before making the purchase of any such rights, or alleged rights, to require the patentee, or any person offering the right for sale, to procure and exhibit for the examination of the intended purchaser, or any person whom he may select, the original patent, or a copy of the specification and claim or claims, together with the drawings where they form a part of the specification and patent, each issued by the United States Patent Office, wherein is fully described in the specification, and in the claim or claims of which is particularly pointed out, just what was allowed, granted, and included in such patent, and no more; and if any person shall exhibit or use as a means for effecting any such sale any such specification, claim or claims, or drawing purporting or represented to have been issued by the United States Patent Office, and which was not issued from and by authority of said office, or shall so exhibit or use any patent or copy of a specification, claim, or drawing issued by said office, but which has afterwards been changed or altered in language or drawing with evident intent to thereby deceive, shall, upon conviction thereof, be deemed guilty of false pretense or forgery, according to the nature of the offense, and shall be liable to a fine of not exceeding one thousand dollars, or to imprisonment not exceeding three years, or both, at the discretion of the court.

SEC. 2. That whoever sells or conveys any interest in any patent right, or grants any license thereunder, knowing that said interest or privilege so purporting to be granted or conveyed has been previously conveyed, in whole or in part, to others, without informing the grantee or grantees of the existence and true nature of such incumbrance or prior right, so far as he has actual knowledge thereof, before receiving any payment therefor, by note or otherwise, shall, upon conviction thereof, be punished by imprisonment not exceeding three years, or by fine not exceeding one thousand dollars, or both, at the discretion of the court.

SEC. 3. That section forty-eight hundred and eighty-five of the Revised Statutes of the United States be amended so as to read as follows:

'Every patent shall bear date as of a day not later than seven months after the time at which it was allowed and notice thereof was sent to the applicant or his agent; and if the final fee is not paid within six months after the date of such notice of allowance, the patent shall be forfeited and withheld."

SEC. 4. That section forty-eight hundred and ninety-five of the Revised Statutes of the United States be amended so as to read as follows:

"Patents may be granted and issued to the assignee of the inventor or discoverer, and they may be reissued to the owner or owners of the entire interest in the patent; but the assignment must first be entered of record in the Patent Office. And in all cases of an application by an assignee for the issue of an original patent, the specification shall be signed and sworn to by the inventor or discoverer, if living; and in all cases of an application by an assignee for a reissue of any patent, the application may be made and the corrected specification sworn to and signed by the inventor or by the owner or owners or legal representatives of the entire interest."

SEC. 5. That the last sentence in section forty-eight hundred and eighty-seven of the Revised Statutes of the United States, being in the following words: "But every patent granted for an invention which has been previously patented in a foreign country shall be so limited as to expire at the same time with the foreign patent, or, if there be more than one, at the same time with the one having the shortest term, and in no case shall it be in force more than seventeen years, shall be, and is hereby, repealed.

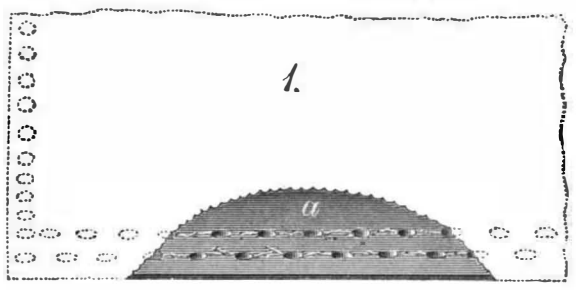
SEC. 6. That no machine or other article made prior to the surrender of a patent, and the issue thereupon of a new patent, which, or the use of which, did not infringe such surrendered patent, shall be held to be an infringement of any of the claims of the reissued patent, which claims were not in the original patent at the time when such machine or other article was made. All rights of action accruing to the patentee, his executors, administrators, or assigns, for profits and damages on account of any infringement of a patent prior to its surrender for a reissue, shall remain unaffected by such surrender, and no suit shall be barred or abated by such surrender; and all suits at law or in equity may be maintained for the recovery of such damages or profits in the same manner as if said surrendered patent had not been surrendered: *Provided*, That nothing contained in this section shall apply to letters patent reissued prior to the passage of this act.

SEC. 7. That for the diffusion of mechanical knowledge and the encouragement of invention, the Commissioner of Patents is hereby authorized to furnish the weekly Official Gazette of the Patent Office, in the form and including the subjects now published therein, to subscribers within the United States at two dollars per annum, and to subscribers in foreign countries at a price not less than the estimated cost price thereof; and the price of uncertified printed copies of specifications of patents, including the printed drawings thereof, shall be ten cents each for any number less than twenty copies, or five cents each for twenty or more copies of the same or of different patents ordered at the same time; and for uncertified manuscript copies of contents of patent-files, or of any other records, the reasonable cost of making the same; and the price for certified copies shall be the same as for uncertified copies, with the addition of twenty-five cents for the certificate and seal; and all such copies of patents, or any other records in the possession of the Patent Office, when certified by the Commissioner, Assistant Commissioner, or Acting Commissioner of Patents as being correct and authentic copies of the originals in said office, shall be evidence in all cases wherein the originals could be evidence; and any person making application and paying the fees aforesaid therefor shall have certified copies thereof.

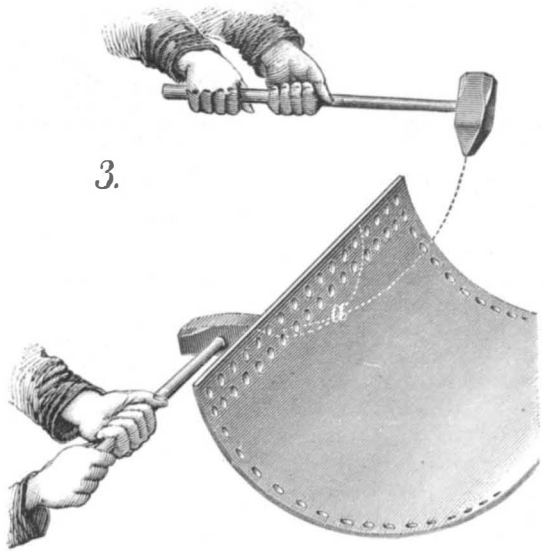
SEC. 8. That all acts and parts of acts in conflict with the provisions of this act are hereby repealed; and the five sections from section forty-nine hundred and twenty-four to section forty-nine hundred and twenty-eight, both inclusive, of the Revised Statutes of the United States are hereby repealed.

STEAM BOILER NOTES.

A letter from a practical boiler maker, in another column, commendatory of the verdict of the SCIENTIFIC AMERICAN on the Dayton, O., boiler explosion, contains much sensible

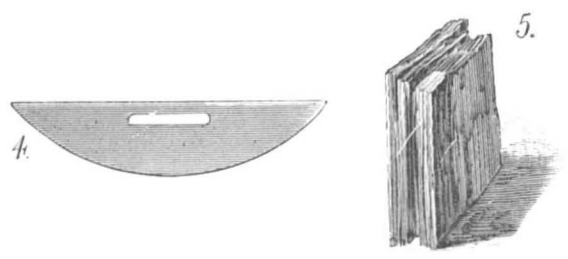


practical matter. The letter was accompanied by a sample of boiler iron cut from a three-eightbs inch plate that had been worked in the boiler shop, but as it was brittle enough to crack and give a sign which was detected by the workman while undergoing the operation of fitting it for its place in a steam boiler, it was very properly condemned. The dotted lines in sketches 1 and 3 indicate its location in the plate.



The plate having been through the punching and roll bending processes, it was found, as is often the case, that the end was flat for a distance equal to half that between the summits of the lower bending rolls, see *b*, Fig. 2, page 184 of Mr. Parker's letter.

The plate was undergoing the hand process of forming the curvature at the end probably by means of sledges in the hands of the workmen, as shown in sketch 3. This



work is often done with the plate standing up on its edge, and many boiler makers use the face of the sledge instead of the "pane;" but the marks on the interior of this sample indicate that a "set" having an acute rounded angle, or else the above described method, was employed upon this sample. While this process is going on it is usually under the direction of a foreman or competent journeyman, who from time to time applies the template, sketch 4, which is a truly cut segment of the desired circle. He also indicates by touching the plate with the end of his template or a stick where he wishes the next blow to fall.

It will doubtless occur to some practical readers that this method not only produces imperfect results, but that it is severe on the iron, particularly when heavy blows are struck with the "pane" of a sledge hammer. This is true, because the plate having been punched is less able than a whole plate to bear the strains of bending in this violent manner. Some iron, having a ductile "skin," might, if more gently dealt with, be able to endure hammer bending and give no sign upon its surface, though seriously injured in its interior.

It is plain, however, that iron that will not endure gently bending to a slight curve without injury after being punched, is totally unfit for boiler construction, though it might stand a tensile strain of fifty thousand pounds per square inch in a testing machine, which always gives a steady and slowly increasing pull in a direction parallel to its plane surfaces.

The piece of iron represented by sketch 5 was sawn from the ruptured edge of the plate that first gave way and caused the explosion of the Dayton boiler. The crack that is spoken of as being older than the date of the explosion was at the "calking edge" of a double riveted longitudinal seam, and this crack formed one of the boundaries of this sample. It was situated just over the line from the end of the plate. It has been digested in the bath for some time.

It will be observed that the better portion of the plate at the two surfaces has been less wasted than the poorer, probably not so snugly piled, and therefore more porous interior, about a third of the thickness. Perhaps the inferior middle portion has also been rendered more open by the hinge bending that it suffered while in the boiler, and by blows of the hammer in setting the curve by hand.

The Sugar Test Decision.

The long controversy with regard to the right of the Treasury Department to apply other than color tests in determining the grade of imported sugars, has at last been decided by the United States Supreme Court, and decided in favor of the position taken by the importers.

The opinion of the court describes the question at issue to be whether the dutiable quality of sugars is to be decided by their actual color graded by the Dutch standard, or by their saccharine strength as ascertained by chemical tests. "The defendant in error maintains the former, the plaintiff in error the latter. The test prescribed by the statute is the Dutch standard of color. If Congress desired the application of the chemical test, why did not Congress say so? Color was the standard which Congress, with the light which it had, saw fit to adopt. If it be found by experience that that standard is a fallacious one can the Executive Department supply the defects of legislation? Congress alone has authority to levy duties. Its will alone is to be sought. It appears very clear from the evidence that the Dutch standard is a color standard only. As applied to the sugars of the Island of Java brought to the mother country it was undoubtedly a very fair standard of the quality of sugar. With new processes of manufacture, however, and with the present perfection of the refining process, color has become a matter of little consequence, provided the sugars contain abundance of saccharine matter. The color standard has come to be a very precarious one. Still, if the government chooses to adhere to it, it is bound by it. If Congress, as it has done, adopt the color standard, it is not for the customs department to adopt a different one. When Congress chooses to do this it will be time enough for the Custom House to follow."

Justices Matthews and Harlan dissent from the opinion of the majority of the Court, on the ground that a color imparted to sugar artificially either during the process of manufacture or after its completion—a color which it would not contract by means of any of the processes necessary merely to the production of sugar—is not its natural color and not the real and true color of the Dutch standard.

Red Snow.

At a recent meeting of the San Francisco Microscopical Society, Dr. Harkness presented a bottle of "red snow," which he gathered last June on the Wasatch Mountains. The red snow was found on the north side of a spur which rose about 10,000 feet above the sea level. When fresh, the snow has the appearance of being drenched with blood, as though some large animal had been killed. The "red snow" is caused by the presence of a one-celled plant called *Protococcus nivalis*, which reproduces itself by subdivision; that is, the cell divides itself into several new cells. This is done with great rapidity, and a few cells lodged in the snow, under favorable conditions, soon will give it the appearance called "red snow." It was remarked that the phenomenon of red snow had been observed from the earliest times, as Aristotle has a passage which is thought to refer to it. The subject was, however, lost sight of until brought up by the investigations of Saussure, who found it on the Alps in 1760. He made chemical tests which showed him that the red color was due to the presence of vegetable matter, which he supposed might be the pollen of some plant. In 1819, an Arctic expedition under Captain Ross brought some specimens from the cliffs around Baffin's Bay, and they were examined by eminent botanists, some of whom mistook the nature of the plant, and there was long discussion as to its proper classification, some holding it to be a fungus, some a lichen; but it was finally set at rest as one of the unicellular algæ. It is of interest also that some of the early examiners pronounced the color due to animalcules, but this was disproved. Dr. Harkness said that during his last visit to England he saw the original bottle of specimens brought from the Arctic more than sixty years before, and in which the *protococcus* could still be seen with the microscope.

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New Method of Oil Printing.

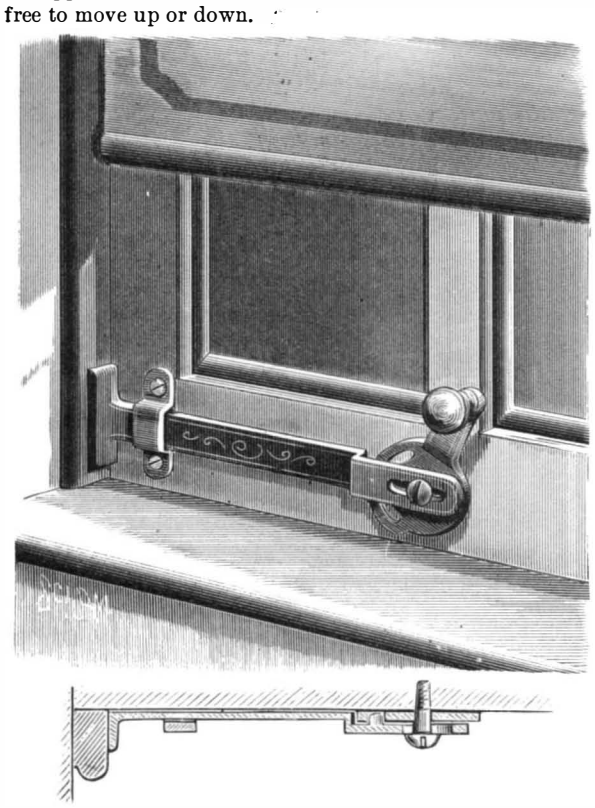
Bogaerts, of Herzogenbusch, has invented a new method of printing in oil colors, which is said to furnish a very close imitation of oil painting, far surpassing what was possible by means of chromo-lithography. It may be applied to painter's canvas, wood, or metal. The following description of his method is given in *New Discoveries and Inventions:*

The first thing to be done is to make a facsimile of the painting that is to be copied, in which the outline of each simple color is accurately reproduced. This copy is then transferred to a plate of zinc, which is cut up into as many pieces as the picture contains different colors, in such a way that each piece represents all the parts which in the original are of one color. Separate electrotypes are made from each piece, and from these the proper colors are printed in corresponding order upon prepared paper. (So far the process is similar to printing chromos.) At the end of this operation, when all the colors have been printed on the paper, the picture resembles an ordinary chromo-lithograph, and like that it is perfectly flat and smooth; the brush marks and roughness of surface noticed in oil paintings are wanting. In order to imitate this part, too, the original painting is covered with a solution of gelatine, in which are impressed with great accuracy the elevations and depressions of the painting. From this plastic copy of the surface another impression is taken in gutta percha, India-rubber, or other elastic substance, which will stretch so that it can be made larger or smaller, according as the copy is enlarged or reduced. This elastic impression is used for preparing a copper stereotype, with which a negative or depressed copy can be made in a suitable plate. This last plate, of course, will have depressions wherever the painting had elevations or raised spots, and these depressions are filled up with pigment of the same color as the raised portions of the original. The plate thus prepared is put in a press and the printed chromo laid on it, and then pressure and heat are applied to cause pigments in the depressions to unite with those already on the paper. The picture is now finished all but varnishing. To carry out the resemblance to oil painting it is afterward transferred from the prepared paper to canvas, wood, or metal. P. N.

IMPROVED SASH FASTENER.

The annexed engraving represents a novel sash fastener, recently patented by Mr. J. V. Risk, of Point Pleasant, W. Va. The invention consists of a bolt provided with a friction plate at the outer end and guided by a strap, and slotted to receive a screw which guides its inner end, and at the same time forms the pivot for the cam whose slot receives a pin projecting from the back of the bolt. The device is secured to the lower rail of the sash in such a position as to admit of pressing the friction plate at the end of the bolt firmly against the stop or side of the window frame.

By turning the slotted cam in one direction, the bolt is thrown outward against the frame with sufficient pressure to hold the sash in any desired position. By turning it in the opposite direction the bolt is withdrawn and the sash is free to move up or down.



RISK'S SASH FASTENER.

The friction plate at the end of the bolt not only holds the sash so that it will not move up or down, but it also prevents the window from rattling.

The smaller view in the engraving is a horizontal section showing the relation of the various parts.

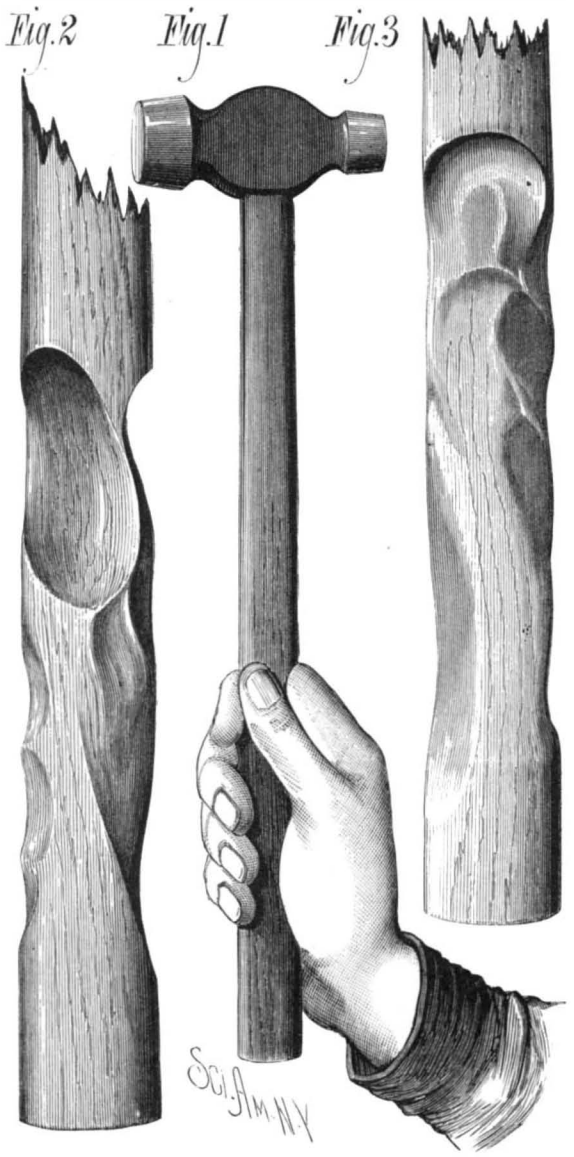
The Northwest Lumber Trade.

The Secretary of the Chicago Lumbermen's Exchange reported to the annual meeting, March 6, that the past year was one of the most successful ever experienced in the Northwest. The receipts of lumber were nearly 2,000,000,000 feet; shingles, 866,000,000; and lath, 104,000,000; while the coarse forest grades by lake aggregate 2,846,000 posts, 4,200,000 ties, and a large quantity of miscellaneous stuff.

A CURIOUSLY WORN HAMMER HANDLE.

The worn hammer handle shown in the engraving is noticeable as an example of rapid as well as curious abrasion of a hard substance by the human hand.

The hammer was used by Michael Collins, of this city, in welding the ends of iron tubes in steam radiators. The cutting of the handle, which is of hickory, was probably



A CURIOUSLY WORN HAMMER HANDLE.

done by the fine scale struck off from the iron and caught by the tough skin of the striker's hand. The hammer is held loosely in striking, and every blow is attended by a slight motion of the handle under a varying gripe. The constant attrition causes the muscles of the palm and fingers to bed themselves, so to speak, in the tough wood, with an impression as perfectly reproducing the inner surface of the hand as would be obtained by squeezing a roll of putty. The oval handle is one inch in its shortest diameter, and where it is worn deepest by the thumb and forefinger only three sixteenths of an inch of wood remains. We are informed that a handle is worn in this way in the short space of three months.

AGRICULTURAL INVENTIONS.

Mr. Norman Mereness, of Seward, N. Y., has patented an improved seed planter and drill. This machine embodies novel combinations which insure accuracy in planting and drilling seeds, and the proper distribution of fertilizers.

Mr. William Mustart, of Jacksonville, Fla., has patented a fruit-picker and tree-trimmer, adapted to the picking of oranges, apples, peaches, or other fruits without damage to the trees, and it may be readily adjusted to act as a tree pruner or trimmer.

Mr. James M. Diffendafer, of Green Center, Ind., has patented an improved hay-rack, having a longitudinal base frame carrying two detachable inclined side frames composed of a series of posts provided at the lower ends with tenons fitting in mortises in the cross bars of the base-frame, the posts being united by longitudinal rails fitting in recesses in the inner sides of the posts, and held therein by a strip pivoted to the inner side of the posts.

Mr. Josiah L. Hughes, of Cleveland, Tenn., has patented a cotton chopper constructed with a carriage, gear-wheels connected with the rotary axle of the carriage, two shafts connected by a universal joint, radial arms being attached to the rear shaft and carrying the chopping knives. The machine has plows provided with colters for barring off the rows.

A novel aid binder attachment for harvesters has been patented by Mr. Mason Hedrick, of Oakland City, Ind. The object of this invention is to furnish an attachment for harvesters by the aid of which one man can bind grain as fast as a harvester can cut it. The improvement consists in adapting the driving mechanism of a harvester to compress the gavel.

An improvement in treadles has been patented by Mr. Thomas A. Parkinson, of York, Neb. This is a compound treadle used by simulation of walking, and adapted for driving corn shellers, printing presses, grindstones, and other machines. By means of this device a constant pressure is applied to the crank shaft, and, the whole weight and strength of the operator being utilized, the power is much greater than that obtained by the ordinary treadle.

Work Yielded by Various Substances.

In a recent lecture at the Crystal Palace, London, Prof. Sylvanus Thompson explained the theoretic work obtained by the consumption of one ounce of various substances as follows:

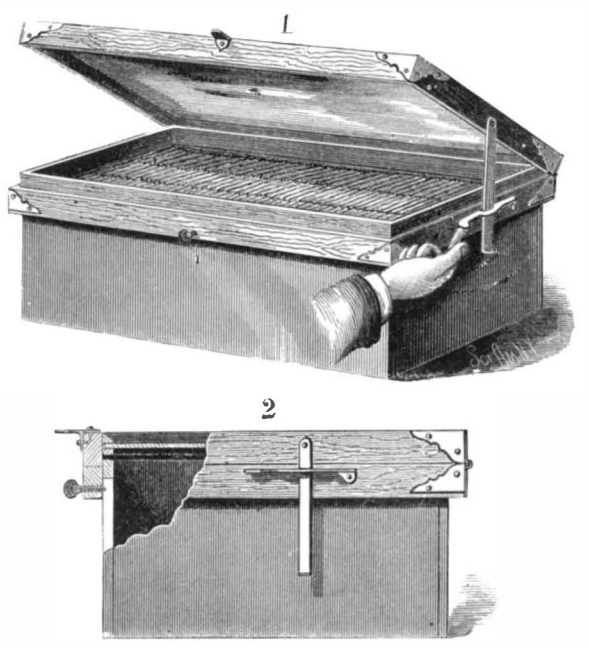
1 oz. of hydrogen	gives	2,925,000	foot pounds.
1 " " coal	"	695,000	" "
1 " " zinc	"	113,000	" "
1 " " gunpowder	"	100,000	" "
1 " " copper	"	69,000	" "

Optical Blindness to Red Light.

A curious effect of bright white light upon the vision is recorded in a recent number of the *Journal de Physique* by MM. J. Macé de Lépinay and W. Nicati. After passing some hours in a snow field brilliantly lighted up by sunshine, it was observed that at least eight hours afterwards all gaslights, candles, and artificial lamps appeared to be strongly colored green. In other words, the red rays of such lights were not perceived. The reason of this was supposed to be the fatigue of the retina for red, which partial effect lasts longer than a similar weariness of other colors. The truth of this supposition may be proved in a very simple manner by obtaining three colored glasses—red, green, and blue—of such relative depth of color that they could be seen through with about equal visual effect with a given power of light. An observer furnished with these glasses is then to place himself at a convenient distance before one of the sight-testing placards commonly used by oculists, and consisting of a white ground printed with black characters of various sizes. If the room is now almost darkened, the blue glass will still permit the observer to distinguish the medium sized characters on the placard, while through the red screen not even the white sheet itself is perceptible. After a time, however—the same degree of semi-darkness being continued—the visual acuteness through the red glass is increased so that the larger characters on the placard may be discerned. The visual perception through the blue glass remains as at first. It is therefore clear that color blindness, of a temporary nature, to the red rays, is more persistent than in respect of the blue rays. Hence may be assigned to physiological reasons the well known fact that a prolonged or even temporary exposure of the eye to the electric light renders it for some considerable time afterward incapable of fully estimating the illuminating power of a gas flame, which is so much richer in red rays.

NEW SHOW-BOX COVER.

It is said that "goods neatly kept are half sold," and experience proves the adage true. The incursions of insects and idlers, the entrance of dust and moisture, seriously interfere with the profits of the retail dealer of many kinds of goods. Many contrivances have been tried to remedy these annoyances, but for one reason or another they have generally proved failures.



LANGLES' SHOW-BOX COVER.

We give herewith an engraving of a simple and efficient device for covering boxes of goods so as to protect them thoroughly while exposing their contents to view. This device consists of a case capable of fitting the goods box, and having a glass cover hinged to it and provided with a support that will hold it at any desired angle.

When the cover is raised it will stay where it is left until the holder is pressed upward by the finger as shown in the engraving.

This invention has been patented by Mr. Justin J. Langles, corner Common and Tchoupitoulas street, New Orleans, La.

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Copying Drawings.

Tilhet's method of copying drawings in any desired color is thus described in the *Polytechnisches Notizblatt:*

The paper on which the copy is to appear is first dipped in a bath consisting of 30 parts of white soap, 30 parts of alum, 40 parts of English glue, 10 parts of albumen, 2 parts of glacial acetic acid, 10 parts of alcohol of 60°, and 500 parts of water. It is afterward put into a second bath, which contains 50 parts of burnt umber ground in alcohol, 20 parts of lampblack, 10 parts of English glue, and 10 parts of bichromate of potash in 500 parts of water. They are now sensitive to light, and must, therefore, be preserved in the dark. In preparing paper to make the positive print another bath is made just like the first one, except that lampblack is substituted for the burnt umber. To obtain colored positives the black is replaced by some red, blue, or other pigment.

In making the copy the drawing to be copied is put in a photographic printing frame, and the negative paper laid on it, and then exposed in the usual manner. In clear weather an illumination of two minutes will suffice. After the exposure the negative is put in water to develop it, and the drawing will appear in white on a dark ground; in other words, it is a negative or reversed picture. The paper is then dried and a positive made from it by placing in on the glass of a printing frame, and laying the positive paper upon it and exposing as before. After placing the frame in the sun for two minutes the positive is taken out and put in water. The black dissolves off without the necessity of moving it back and forth.

FRESH GRAPES FOR THE TABLE.

Our engraving is an actual representation of a vine grown by Herr Sage, gardener of Lord Brownlow. It was carried in October of last year to the Exposition at South Kensington, where it received the highest medal from the committee on fruit. A yet more beautiful and regular vine was carried to the Exposition at Ealing Park, by William Cole, in 1873. In both of these cases the vine was propagated according to the system of Mr. William Thompson, who has published a work called "The Practical Treatise on the Grapevine."

We can recommend the growing of fruit vines in pots to gardeners and amateurs, as being easily accomplished, and the nature of the vine is such that more satisfactory results may be obtained in a shorter time than from the propagation of fruit-trees in pots. By this means of cultivation fruit may be obtained from the rare southern vines. Nothing can be more beautiful than a natural centerpiece of this kind; it would be an ornament even for a royal table. England has set the example in this method of vine growing.

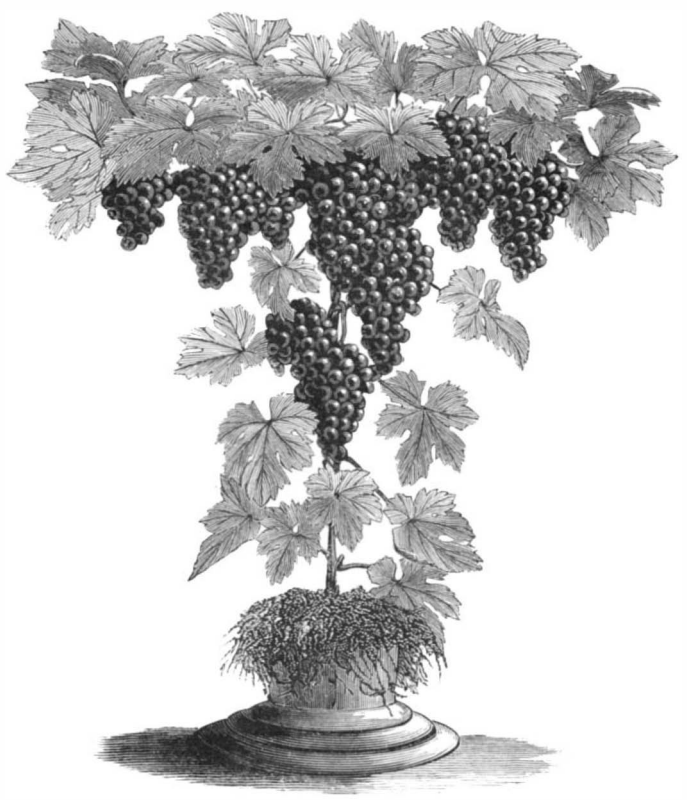
The cultivation of the vines designed for pot culture may be carried on for one or two years in baskets in the open ground. By this means the roots may be properly held together, and transferring the plants to pots may be successfully accomplished. This should be done in March, before the buds begin to start. With warmer weather a rich compost earth should be used, which, mixed with a small quantity of cow hair from a tannery, forms an excellent manure. The pot should be covered with moss, so that it will not dry up, and it is to be buried in the earth so that it may remain uniformly moist, the ground being sprinkled from time to time. When the strong table varieties of grapes are used for pot culture the vines must not be too much pruned. It is better to prune the plants in the autumn rather than in the spring, because then the sap will not escape, and the vines in baskets or pots may be protected from frost, so that there will be no loss of buds.

Among the varieties of grapes which are best adapted to pot culture the ordinary blue *Trollinger*, called in England the "Franconia Valley," stands at the head. Close to this comes the *Pariser gutedel*, also the *Chasselas fontainebleau*, which is a free bearer, having a beautiful large gold-colored grape, and is universally esteemed.

In 1879 the establishment of Van Houtte, in Ghent, in order to assist amateurs in the pot culture of vines, announced for sale (at from 5 to 8 francs) twenty different kinds of vines. They were placed in large pots, after the English method of culture, and were very strong plants, from which fruit might be expected. Among the varieties were the long clustered and very sweet *Black Prince* and the *Black Alicante*, which is worthy of recommendation. The last is a vine of strong growth, has broad, large clusters of grapes, nearly black, which will keep for a long time and neither decay nor shrivel up.

The novelties are somewhat more expensive. The *Muscat Derom* has large golden berries in beautiful clusters, with the delicious taste of the *Frontignan*. Mr. Pearson introduced an English novelty in 1876, a very large grape, of a greenish golden color, which will keep for a long time.

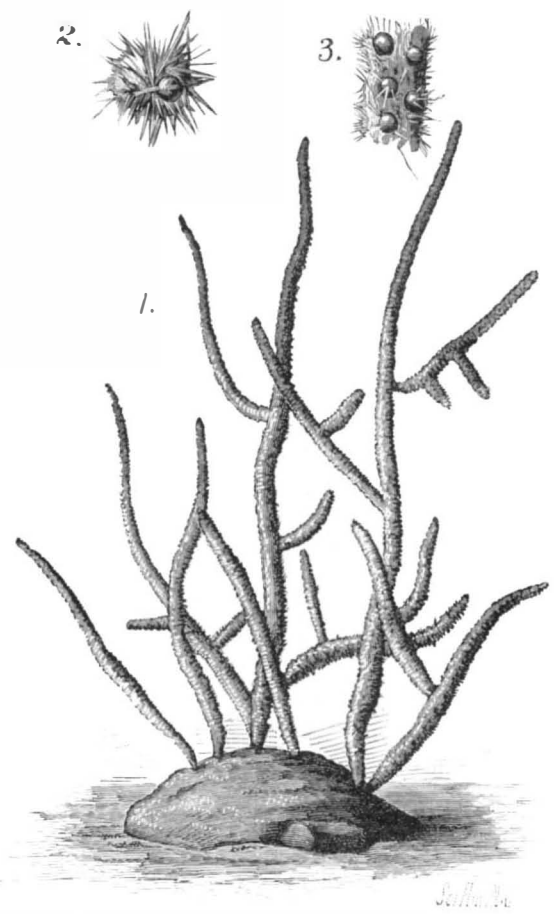
Robert's Gros Guillaume is also an English variety of 1877, with enormous clusters of very large black grapes. The Alnwick Seedling is a novelty of 1878, with broad clusters of oval black berries, which keep well and are of the best quality. Finally, the Muscat Charles Alberdienst is a novelty which cannot be surpassed, has a very large black berry, which has a very pleasant perfumed taste, and bears very freely. It is one of the best and most beautiful of existing grapes.—*Illustrirte Garten-Zeitung.*



GRAPEVINE GROWN BY HERR SAGE.

SPONGILLA FLUVIATILIS.—THE CAUSE OF CUCUMBER TASTE IN WATER.

Last fall note was made of the fact that the offensive cucumber odor and flavor of certain portions of the water supply of Boston had been traced by Professor Ira Remsen to a fresh-water sponge in one of the reservoirs. A full report of Professor Remsen's investigations has now been received in the report of the Boston Water Committee. [City Document 143, 1881.]



SPONGILLA FLUVIATILIS.

As the cucumber disorder in public water supplies has caused much public discomfort and disquiet in Boston before, and also in several other cities, and, in the absence of proper precautions, is liable to be repeated, the discovery made by Prof. Remsen is of great importance. Our Croton water was affected much the same way two years ago; and several other cities have suffered from it, among them Hartford, Conn., in 1871; New Haven, Conn., in 1864–65 and 1872; Norwich, Conn., for several years in succession; Jacksonville, Ill.; Holyoke, Mass.; Lynn, Mass.; St. Paul, Minn.; Keene, N. H.; Albany, N. Y.; York, Pa.; Baltimore, Md., and others.

When the Baltimore water was similarly affected, in the winter of 1880–81, Professor Remsen searched in vain for the cause, in view of which fact, and the repeated failure of careful investigators to solve the mystery in other places, he attacked the problem in Boston in no very hopeful spirit. With great patience and skill, however, the source of the contamination was traced to a body of water called Farm Pond, and, in that, to certain organized masses, which Professor W. G. Farlow, of Harvard College, pronounced to be fragments of a fresh water sponge. A specimen was then submitted to Professor Hyatt, of the Boston Society of Natural History, who confirmed the judgment of Prof. Farlow. This sponge (*Spongilla Fluviatilis*), Prof. Hyatt says, is common in fresh water ponds, and in some places is very abundant. It has the cucumber odor while living, and the odor is intensified by decay. Masses of the sponge easily decompose, and are found part living and part dead.

Professor Remsen says in his report: "These masses [of sponge] growing upon the bottom easily become disintegrated, and undergo decomposition; and both the growing masses and the disintegrated parts must contribute to the taste of the water, though naturally the principal effect is due to decomposition. As this decomposition takes place the more readily the nearer the masses approach the surface of the water, the water near the surface has a stronger taste than that near the bottom." He adds, "I believe the presence of this sponge in Farm Pond furnishes a satisfactory explanation of every fact which has been observed in connection with the present condition of the water," and expressed the belief that the sponge would be found growing in the pond if the water were drawn off. The prediction was confirmed, large quantities being discovered on rocks at the bottom of the pond.

The cactus-like appearance of the growing sponge is shown in the accompanying engraving, one third natural size. The living sponge is green. It turns brown in decay. It possesses remarkable power of propagation, but seems to exhaust itself after a time, leaving the water in which it grew comparatively free from it, perhaps for years.

MISCELLANEOUS INVENTIONS.

Mr. Charles T. Christmas, of Lake Beulah, Miss., has patented an efficient and cheaply-constructed device by which the wires used for fences may be stretched in making the fence and held in place while being spiked to the posts. By the same implement the wire may be cut when desired.

A new apparatus for raising and lowering boats has been patented by Mr. Reginald H. Earle, of St. Johns, Newfoundland. This improved apparatus consists of a swinging frame and gravity cradle for carrying the boat bodily, and these are combined with davits in such manner that either can be used independently.

A novel packing fastener for furniture has been patented by Mr. Marion E. McMaster, of Shelbyville, Mo. The device consists of a plate formed with two or more points or barbs and two or more holes. In use the barbs are driven into the ends of the bars or pieces of furniture, and the fastener is further secured by nails passing through the holes.

A cigarette holder, made collapsible in order that it may retain its contents in good condition at all times, and also made waterproof to exclude dampness and perspiration, has been patented by Mr. Gabriel Rodriguez, of Matanzas, Cuba.

Mr. James Newby, of Paterson, N. J., has patented an improved device for stopping the rotation of the spindles of quilling-frames in case the silk thread that is being wound from the reel upon the bobbin breaks. This device consists of a lever held out of contact with a stop by the thread. When the thread breaks the lever drops and stops the spindle.

Mr. John Newkirk, of New York city, has patented a deflector for cuspidors, whereby the cuspidor may be entirely closed to prevent the escape of odors and the contents of the cuspidor deflected to the sides, entirely out of view.

Mr. Galen A. Peirce, of East Freetown, Mass., has patented an implement or tool for lasting the shanks of boots and shoes, adapted for rapid and easy application, and to be used in various ways or positions according to the position of the workman. The device is made so that the leverage will be continuous for drawing the upper to any extent desired at each grasp or hold upon the upper.

Messrs. Philip H. Sprague and Tobias A. Sprague, of Cornell, Ill., have patented an improved valve or plunger for pumps which is adjustable or expansible to take up the wear. The invention consists principally in the bucket or valve cup, formed of a single piece of vulcanized rubber, in combination with a metal cup placed inside the rubber cup, with a removable washer placed between the bottom of the metal cup and the bottom of the rubber cup.

Mr. George Van Dyke, of Skaneateles, N. Y., has patented an improved combined bag holder and truck. The truck is provided with handles at its upper end, and at its lower end are two wheels and a platform, which forms the nose of the truck and supports it in an upright position, and also serves for the bottom of the bag to rest upon. The back of the truck is provided with a slot in which works a sliding block to which is attached a hopper and a bag-holding device.

An improvement in fishing rods, patented by Mr. Henry Prichard, of Brooklyn, N. Y., consists in combining an elastic tube, cap, and thread with a wooden core. The rod section consists of a central core of wood and an outer tube of India-rubber or similar material, covering the lower end of the section. The covering will extend a suitable distance upon the wood, according to the style of rod, and is retained by a metal cap at the outer end, and a winding of thread around the wood at the inner end of the tube.

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Correspondence.

Steam Boiler Explosions.

To the Editor of the Scientific American:

SIR: In your issue of December 17, 1881, there occurs the following:

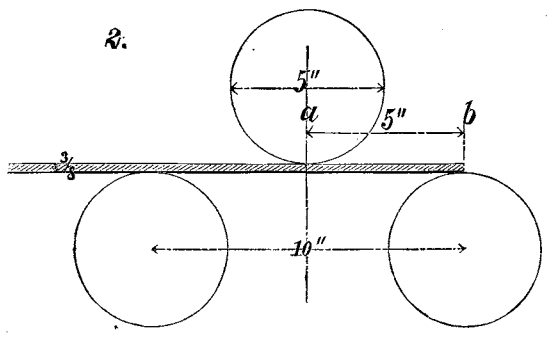
"The owners of these new and apparently well made and thoroughly equipped boilers ought not to be told that it is impossible to determine the cause of the explosion. They, in common with most thinking men, no doubt believe that there was a sufficient cause, which somebody ought to be able to explain."

Forty years' experience as a boilermaker may plead my excuse for meddling with the explosion at the Dayton Wheel Works, Ohio, as reported in your issues of December 17 and January 7. In the last I am happy to see that the bath or wash to which you caused the fractured piece of plate to be subjected has at once and forever put an end to the white-washing of boiler explosions, and revealed what has long been suspected by all intelligent boilermakers of my acquaintance. That suspicion is now seen to be a reality, and the cause of the primary rupture is at once traceable to the bending rollers and the prevailing method of setting the ends of boiler plates for cylinder boilers. In a word, the present system involves the end of the plate first entering the rollers in such a set of circumstances as to insure its destruction.

"The SCIENTIFIC AMERICAN has made a careful examination of the exploded boiler of Messrs. Pinneo & Daniels, and finds that the explosion was due to the bad quality of the iron at the line A B; that the plate at this point was brittle; that this brittle iron was subjected to slight hinge-bending motions caused by variations of pressure on the *flattened* portion of the boiler at the broad seam; that these motions tended to crack the poor iron; that the plate at the line A B showed the existence of a crack of older date than the explosion; that the steam pressure indicated by the engine-room gauge was sufficient to cause the explosion, in view of the cracked and impoverished nature of the iron."

In this quotation one sentence tells the story; it is the following: "The flattened portion of the boiler at the broad seam." This sentence tells a fearful tale with respect to the bending of the plates, for the exploded boiler and the picture of the piece submitted to the bath, shown in the issue of January 7, proves that although the damage done the plate in the process of setting was not visible to the unaided eye, yet it existed, and to such an extent as to render the plate far from being trustworthy. Every blow of the hammer used in the attempt to bend the portion left unbent by the roller is registered on the plate in unmistakable fractures of the material.

While preparing this article for your consideration I have been engaged through the day in the construction of a boiler 6 feet in diameter, plate three-eighths of an inch thick, and of the usual quality that is put in shells of mill boilers. Our rollers are 5¾ inches diameter, and the bottom rollers are 10 inches from center to center. Now, as the three rollers are alike in diameter, it follows that when the top roller is three-eighths of an inch above the others, and the plate shoved in, its position will be thus:



You see that from the center of the top roller, *a*, to the end of the plate, *b*, is five inches. This portion of the plate will be unbent and remain so until set by the hammer, which is often done before any further progress is made in the further bending of the plate. The result of this hammering is sometimes the complete destruction of the plate, as in the case of the plate of which I have forwarded you a piece, which has a tongue to tell its own tale. At other times the injury may not be so visible as in the case of the exploded boiler, but nevertheless it is there awaiting the time when it will show itself in the destruction of life and property.

Now, sir, I repeat that the primary cause of the explosion was the damage sustained by the plate in bending, and that all the evils of a wrong system seem to have gathered about that particular *flattened broad seam*, which was, to say the least of it, acknowledged by the engineer to be defective; and inasmuch as it had been calked during the week previous to the explosion it shows plainly that it had never been close.

Now, sir, I blame no man for the explosion. I blame the system which the careful examination, made by the SCIENTIFIC AMERICAN, has brought to light, and enabled me, however imperfectly, to bear witness to the assertion that there was a cause; and from henceforth let it not be said of boilermakers, when they complain of the rollers, that it is their ignorance and prejudice that cause them to do so. But let there be a careful revision of the whole system, in the interest of truth, justice, and public safety, and manufacturers of boilers and users will all be benefited by the result.

ROBERT PARKER.

DECISIONS RELATING TO PATENTS, TRADE MARKS ETC.

Supreme Court of the United States.

STOW *vs.* THE CITY OF CHICAGO.—PATENT PAVEMENT.

1. PATENTEE ENTITLED TO ALL USES OF INVENTION.—A patentee who is the first to make an invention is entitled to his claim for all the uses and advantages which belong to it, and it is immaterial whether he perceived and stated such advantages in his patent.

2. REISSUE No. 3,274.—STREET PAVEMENTS.—ANTICIPATING.—So the wood pavement described in Reissue Patent No. 3,274, *Held* to be anticipated by the patent of Stead, which does not in terms say that the purpose of driving the wedge-shaped block or pile through the space left by the octagonal blocks is to pack the earth or sand foundation, it appearing that such a result must follow from the construction described.

3. LETTERS PATENT No. 134,404.—WANT OF INFRINGEMENT.—When every other part of the invention described in Letters Patent No. 134,404 was shown to be old, doubted whether it can be called invention to have the ground in the spaces between the blocks more compactly rammed, so as to drive it below the under surface of the pavement into the earth foundation; but the evidence failing to show that the defendant used this feature of the invention the bill is dismissed.

Appeal from the Circuit Court of the United States for the Northern District of Illinois.

The first patent relied on is the Reissue No. 3,274, dated January 19, 1869, of an original patent granted to him, numbered 72,110, and dated December 10, 1867.

The invention covered by the reissued patent is thus generally described in the specification:

The nature of my invention consists in putting down a pavement of wood or other suitable material upon a foundation bed of sand or loose earth, and packing the sand or earth by means of wedge blocks driven down into the same and forming a part or whole of the pavement.

The pavement described in this reissued patent consisted essentially of blocks of wood or other material set up on end in rows across the street, with spaces between the rows, in which were driven narrow and probably wedge-shaped blocks, which, when driven down, extended a considerable distance below the under surface of the blocks first named into the foundation bed of sand on which they rested.

No particular form of block is described in the claims, except that some of the blocks used have their lower ends made wedge-shaped. All, therefore, that there is left for the invention described in the first and third claims to cover is the making of the lower ends of a portion of the blocks of which the pavement is composed in wedge shape and the driving of these wedge-shaped blocks below the general under surface of the pavement into the sand or earth bed on which it rests, so as to pack it and render it solid and unyielding.

When thus reduced to what it really is the invention of the appellant is clearly and distinctly anticipated by the English patent issued to David Stead, dated April 23, 1839, which is set out in full in the record.

One of the drawings which accompanies Stead's specifications shows a pavement laid with contiguous rows of octagonal blocks, so placed as to leave rows of square unfilled spaces. In these square spaces were placed square blocks, longer than the octagonal blocks and wedge-shaped at the lower end, and these were driven down into the earth foundation, upon which the octagonal blocks rested.

It is true this specification does not in terms say that the purpose of driving the wedge-shaped block or pile through the space left by the octagonal blocks is to pack the earth or sand foundation, but that it does so as effectually as the use of similar blocks in a similar way under the patent of appellant is too clear for argument.

A patentee who is the first to make an invention is entitled to his claim for all the uses and advantages which belong to it. (*Woodman vs. Stimpson*, 3 Fish., 98.)

It is shown that Stead invented this device. Whether he perceived and stated all its advantages is immaterial. (*Tucker vs. Spaulding*, 13 Wall., 453; Mr. Justice Clifford in *Graham vs. Mason*, 5 Fish., 1.)

Stead's specifications, it is clear, cover (to use the language of Stow's reissued patent), "a pavement composed of wood laid on a foundation-bed of sand or loose earth," and having "a portion of the blocks of which it is composed driven down into said foundation-bed."

Everything, therefore, in the first and third claims of appellant's reissued patent which he sets up as new was anticipated nearly thirty years by Stead's English patent. Appellant's patent, therefore, so far as it covers these claims, is void, and cannot be the foundation of any relief against the appellee.

The other patent which appellant insists that the appellee has infringed is No. 134,404, dated December 31, 1872, issued to appellant as the original inventor.

The invention covered by this patent is described in the claim as follows: "A pavement composed of blocks laid in rows directly upon the sand foundation, with spaces between the rows filled with sand or gravel, which is swaged or driven into sand foundation, substantially as and for the purpose specified."

The use of wood for street pavements, the laying of blocks directly upon a sand foundation, the placing of the blocks in rows, leaving spaces between the rows, are all old devices. As already shown, they are all to be found substantially in the English patent of Stead, issued April 23, 1839, and they are found in the English patent to Lillie, dated October 13, 1860, and the American patent to Richard H. Willett, No. 114,895, and dated May 16, 1871, all of which are put in evidence by the appellee.

The evidence is distinct and clear that the invention thus defined was anticipated by the pavement laid by J. K. Thompson, City Superintendent, in the year 1864, at the intersection of North State and Kinzie streets, in the city of Chicago. This piece of pavement was made of wooden blocks, six inches square, set in rows on an earth foundation, with spaces between the rows, and the spaces filled with fine gravel and the gravel rammed. This pavement was put down by Thompson as an experiment. It proved successful. It was in use until the great fire in Chicago in 1871.

Without noticing the other defenses, we declare our opinion to be that the appellant is not entitled to any relief against the appellee upon either of the patents on which his demand for relief is now based. His case, as presented here, has no ground to stand on. The decree of the Circuit Court dismissing his bill must therefore be affirmed.

Mr. Justice Woods delivered the opinion of the court.

United States Circuit Court—Southern District of New York.

HART *vs.* THAYER.—PATENT NECKTIE.

Blatchford, J.:

The improvement in neckties set forth in reissued letters patent No. 7,909, which consists in securing a straight pin to the shield by means of metallic fastenings—*i. e.*, metallic rivets either separate from or struck out from the body of the pin, which pass through the shield and are clinched or headed on the opposite side—is not infringed by a mode of securing pins to the shield, which dispenses with separate fastenings, and which consist in forming two bends in the length of the pin, so that by passing through suitable holes in the shield the pin may fasten itself.

This suit is brought on reissue letters patent No. 7,909, granted to the plaintiff, William H. Hart, Jr., October 9, 1877, for an improvement in neckties, the original patent, No. 159,921, having been granted to him February 16, 1875.

By the Commissioner of Patents.

EX-PARTE FAIRCHILD.

TRADE MARK.—PROPER NAME OF APPLICANT.

The mere name of a person does not form a proper subject for trade mark registration, although it appears that such name, by long association with a certain line of goods, has come to be applied as a name or title to such goods.

MARBLE, *Commissioner:*

Appeal is taken in this case from the decision of the Examiner of Trade Marks, who refused to register the word "Fairchild" as a trade mark, because it was "merely the name of the applicant."

Applicant alleges that the Examiner erred in refusing to register his alleged trade mark, first, because the word "Fairchild" has been used as a trade mark in connection with his manufacture and sale of pens and pencils for twenty years and upward, and is well known to the commercial world as the trade mark of the applicant; second, because said word was registered as a trade mark in this office under the act of July 8, 1870, which act contained similar prohibitions to the act of March 3, 1881.

By the third section of the act of March 3, 1881, it is provided that:

But no alleged trade mark shall be registered unless the same appear to be lawfully used as such by the applicant in foreign commerce or commerce with Indian tribes, as above mentioned, or is within the provision of a treaty, convention, or declaration with a foreign power, *nor which is merely the name of the applicant.*

HELD BY THE COMMISSIONER.

While it may be true that the name of the applicant in his trade is of great value, it cannot receive registration in this office as such in violation of the prohibition of the statute. The prohibition of the statute was intended to prevent any person from using his name in any trade as a trade mark to the exclusion of other persons of the same name in the same or any other avenues of trade. This intention of Congress would not be carried out if registration was permitted of the name of any person as a trade mark, however long it may have been used.

The decision of the Examiner of Trade Marks is affirmed.

A Smuggling Locomotive.

The London *Times* states that a singular adaptation of the locomotive has just been made in Russia. Information having been given to the authorities at Alexandrovo, on the Polish frontier, that the locomotive of the express leaving that station for Warsaw had been ingeniously converted into a receptacle for smuggled goods, it was carefully examined during its sojourn at the station. Though nothing was found wrong, it was deemed advisable that a custom-house official should accompany the train to its destination, where the engine furnace and boiler were emptied and deliberately taken to pieces. In the interior was discovered a secret compartment containing 123 lb. of foreign cigars and several parcels of valuable silk. Several arrests were made, including that of the driver, but his astonishment at finding the engine to which he had so long been accustomed converted into a hardened offender against the laws was so genuine that he was released and allowed to return to his duties.

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The Channel Tunnel.

The attention which the Channel Tunnel project is attracting in England, chiefly from a military point of view, raises the enterprise to the first place in international if not engineering interest.

The recent sale of the experimental tunnel property of the Southeastern Railway Company, at Shakespeare Cliff, to the Submarine Continental Railway Company, coupled with the fact that the capital of the Submarine Company is now placed, and the further fact that a French company are industriously at work on the Calais end of the tunnel, may be taken as a guarantee that the enterprise has passed beyond the stage of mere discussion, and that unless stopped by government or by unforeseen engineering difficulties or financial disaster it will go on to realization. The English property transferred comprises something over a mile of experimental boring, and three miles of shore within the limits of which alone a tunnel is held to be practicable. Colonel Beaumont, whose machine is used in boring through the chalk, said, at the meeting to ratify the purchase, that the boring is now going on at the rate of twelve yards a day of seventeen hours, but it was expected that by the use of a new machine soon to be put in it would be possible to accomplish one yard an hour. The experimental boring is seven feet in diameter. The chalk on the English side is quite dry; there is no exhalation of carbonic acid, and the compressed air used in running the boring machine secures ample ventilation. The chalk cut out by the machine is delivered in the wagons, only two men being employed at the heading. The proposed point for beginning the tunnel is called Fan Hole, a little eastward of the South Foreland. From the town of Dover the approach would, as is now suggested, pass at a depth of 300 feet below the seaward spur of the outer wall of Dover Castle.

On the French side the company which has undertaken the southern half of the tunnel have made considerable progress in their work. The borings are near the little village of Sangatte, about six miles from Calais. Here the company have erected substantial buildings of brick and concrete for the engines and air-compressing machinery, and a tramway to carry off the material dug out runs to the edge of the cliff, which rises a hundred feet or more above the beach. Recently the works were visited by a number of the officers of the English company.

Two shafts have been sunk at a distance of forty or fifty yards apart, and by the larger of these the visitors descended to examine a horizontal cutting. About 70 feet below the surface the borers have found the *craie de Rouen*, strata corresponding to the lower portion of that homogeneous gray chalk which some geologists have called the chalk without flints. At a depth of 78 feet the brick lining of the pit ceases and the employment of wooden "tubbing" begins, this being carried down to a depth of 204 feet, when the chalk becomes so dry and hard that a lining is no longer required. The depth of the shaft is about 280 feet, and going about 6 feet lower down by a ladder through a hole at one side a gallery, 8 feet high and of the same width, is entered. This opens into one of equal diameter running nearly at right angles, which, with a slightly upward inclination, to provide for drainage, runs in a northeasterly direction, but trending to the northward—that is, toward the sea—with a curve having a radius of one kilometer. It is to be 1,850 yards long. Artificial ventilation has not been found necessary so far, the two shafts, with both of which it is in connection, providing for an up and down current of air. This gallery is about 170 feet below low water mark, but no portions of these workings have yet been pushed out under the sea. M. Alexandre Lavalley, the contractor for the Suez Canal, who has offered to undertake the construction of the tunnel for the French *Concessionaires*, is to drive another gallery of equal length in the same direction as, but not immediately over, the one already begun. He will employ Brunton's cutting machine, while in the lower gallery Beaumont's machine will be used, both machines being driven with compressed air. It is found in the lower gallery that there is but little percolation of water, and that such as runs in comes from springs in fissures. What does flow in is pumped out at the rate of 60 gallons per minute. At a depth of 288 feet a bed of greensand less than 7 feet thick is reached, and then the galt.

The air-compressing machinery on the French side is to be superintended by M. Welker, the engineer who had charge of the machinery used in the St. Gothard Tunnel.

Color Changes in Sea Waters.

Mr. John Aitken, F.R.S.E., of Darrock, Falkirk, has been working on the cause of the constant change in the color of the Mediterranean and other waters, which he dealt with in a paper read at a recent meeting of the Royal Society of Edinburgh, and in the course of which he explained a series of experiments which he had made to find out the cause of the change. He remarked that the colors of the waters referred to were extremely beautiful, and that they changed from hour to hour and from day to day. The most brilliant effects were seen in the Mediterranean after high winds had been blowing toward the shore, and the tints were so varied that no artist's colors could produce them. Many theories had been propounded in order to explain the phenomena, and one of them was that they were caused by the marvelously blue sky being reflected from the surface of the water. But that theory did not explain any of the effects, because he had frequently seen the Mediterranean deeply and richly colored under a white or cloudy sky. Another theory, called by Mr. Aitken the "selected reflection theory," was that the blueness was produced by the presence in the water of very minute particles, or something in a very minute form, which reflected light. A third theory, called the "selected absorption theory," was that the blueness was produced by the absorption of light.

The author then proceeded to explain the experiments which he had made at Mentone last spring in order to determine which theory was the correct one. By passing the water through long tubes, blackened inside, and with a piece of paper at one end and a mirror at the other, he found that the Mediterranean matter transmitted a blue-green light; and by sinking vertical tubes under the surface of the water with reflectors at the lower end, and looking down at a plate, he found that the blue was of a color too exquisite to describe in words. These results proved that the absorption theory was the true one, and that the selected reflection theory did not hold good. He next sank different colors under the water to a given depth, and found that white changed to blue, that yellow became green, and purple became violet. Perhaps the most satisfactory test was the sinking of a purple colored object about two feet below the surface of the water. It became perfectly blue, the whole of the red component being absorbed.

By means of vessels filled with blue solution, Mr. Aitken demonstrated how solid matter in suspension was necessary to produce the phenomena witnessed in the Mediterranean. The amount of suspended matter in the Mediterranean, he remarked, was something enormous. He subsequently detailed the results of his examination of the waters of Lake Como and Lake Geneva, and stated, in regard to the latter lake, that the white bottom influenced the appearance of the water. He also referred to the examination which he had made of the waters of the west coast of Scotland, pointing out that the appearance of green water was a proof that it was due to absorption, and that the solid matter determined the brilliancy of it. Yellow sand particles produced green water. By distilling water he had ascertained that blue was the color proper to water.

Methods of Chemically Reproducing Drawings.

The following excellent account of the various processes in use for copying plans by the agency of light is translated in the *American Architect* from the pages of *Le Génie Civil*:

For reproducing a drawing at a different scale from the original, or for copying plans on very thick paper, the assistance of a camera, sensitive plates, reageants of various kinds, and an operator skilled in the difficult manipulations of the photographic art will be needed, but anything which is or can be drawn in line on thin paper or tracing cloth may be copied with simple materials and without skilled assistance.

The simplest method of accomplishing this consists in the employment of the so-called ferro-prussiate or "Marion" paper, which is prepared by covering one side of the sheet with a mixture of red prussiate of potash (ferrocyanide of potassium) and a salt of peroxide of iron; under the influence of light, that is under the white portions of the drawing to be copied, the ferric compound is reduced to the state of a ferrous salt, which gives with the red prussiate of potash an intense blue coloration, analogous to Prussian blue. This coloration is not produced in the portions of the sensitive paper protected from the light by the black lines of the drawing to be copied, and on washing the print the design appears in white lines on a blue ground.

The formula for preparing the sensitive paper is as follows:

Dissolve 8 parts of red prussiate of potash in 70 parts of water; dissolve separately 10 parts of ammoniacal citrate of iron in 70 parts of water; filter the two solutions through ordinary filtering paper, and mix them. Filter again into a large flat dish, and float each sheet of paper to be sensitized for two minutes on the surface of the liquid, without allowing any of this to run over the back of the paper. Hang up the sheets in a dark place to dry, and keep them from light and dampness until used. They will retain their sensitiveness for a long time.

The paper being ready, the copy is easily made. Procure either a heavy sheet of plate glass, or better, a photographer's printing frame, and lay the drawing to be copied with the face against the glass; on the back of the drawing lay the prepared side of the sensitive paper, place upon it a piece of thick felt, and replace the cover of the printing frame, or in some other way press the felt and papers firmly against the glass. Expose, glass side up, to sunshine or diffused daylight, for a time varying with the intensity of the light and the thickness of the paper bearing the original drawing from a few minutes to several hours. It is better to give too much than too little exposure, as the color of a dark impression can be reduced by long washing, while a feeble print is irremediably spoiled. By leaving a bit of the sensitive paper projecting from under the glass, the progress of the coloration can be observed. When the exposure has continued long enough the frame is opened and the sensitive sheet withdrawn and thrown into a pan of water, to be replaced immediately by another, if several copies are desired, so that the exposure of the second may be in progress while the first is being washed and fixed. The water dissolves out the excess of the reagents used in the preparation of the paper, and after several washings with fresh water the print loses its sensitiveness and becomes permanent. It is advantageous, after several washings with water, to pass over the wet surface a weak solution of chlorine or of hydrochloric acid, 3 or 4 parts of acid to 100 of water, which gives brilliancy and solidity to the blue tint, and prevents it from being washed out by long soaking. This should be followed by two or three rinsings with fresh water, and the print may then be hung up to dry, or placed between sheets of blotting-paper.

This mode of reproduction, whose simplicity has led to its adoption in many offices, has the inconvenience of giving a copy in white lines on a blue ground, which fatigues the eye in some cases, while the application of other colors is impracticable. By repeating and reversing the process, copying the white line print first obtained on another sensitive sheet, a positive picture, representing the black lines of the original by blue lines on a white ground, can be obtained; or the same result may be reached by a different mode of treating the sensitive paper.

Several varieties of paper called "caynoferric," or "gommoferric," are sold, which have the property of giving a positive image. The mode of preparation is nearly the same for all: Three solutions, one of 60 parts by weight of gum-arabic in 300 of water; one of 40 parts ammoniacal citrate of iron in 80 parts of water; one of 25 parts perchloride of iron in 50 of water, are allowed to settle until clear, and are then decanted, mixed, and poured into a shallow dish, the sheets being floated on the surface as before, and hung up to dry. The solution soon becomes turbid, and must be used immediately, but the paper once dry is not subject to change unless exposed to light or moisture. The reactions involved in the printing process are more complex than in the first process, but present no particular difficulty. Under the influence of light and of the organic acid (citric) the perchloride of iron is reduced to a protochloride, and on being subjected to the action of ferrocyanide of potassium the portions not reduced by the action of the light, that is, the lines corresponding to the black lines of the original drawing, alone exhibit the blue coloration. The gum plays also an important part in the process by becoming less soluble in the parts exposed to light, so as to repel in those portions the ferrocyanide solution. The mode of printing is exactly the same as before, but the paper is more sensitive, and the exposure varies from a few seconds in sunshine to fifteen or twenty minutes in the shade. The exact period must be tested by exposing at the same time a slip of the sensitive paper under a piece of paper similar to that on which the original drawing is executed, and ruled with fine lines, so that bits can be torn off at intervals, and tested in the developing bath of ferrocyanide of potassium. If the exposure is incomplete, the paper will become blue all over in the ferrocyanide bath: if it has been too prolonged no blue whatever will make its appearance, but the paper will remain white; if it is just long enough, the lines alone will be developed in blue on a white ground.

During the tests of the trial bits the printing frame should be covered with an opaque screen to prevent the exposure from proceeding further. After the exact point is reached the print should be removed from the frame and floated for a few moments on a bath of *saturated* solution of ferrocyanide of potassium, about one part of the solid crystals to four of water. On raising it the design will be seen in dark blue lines on a white ground. It is necessary to prevent the liquid from flowing over the back of the paper, which it would cover with a blue stain, and to prevent this the edges of the print turned up all around. On lifting a corner, the progress of the development may be watched. As soon as the lines are sufficiently dark, or blue specks begin to show themselves in the white parts, the process must be immediately arrested by placing the sheet on a bath of pure water. If, as often happens, a blue tint then begins to spread all over the paper, it may be immersed in a mixture of 3 parts of sulphuric acid, or 8 parts of hydrochloric acid, to 100 parts of water. After leaving it in this acidulated liquid for ten or fifteen minutes, the design will seem to clear, and the sheet may then be rinsed in a large basin of water, or under a faucet furnished with a sprinkling nozzle, and a soft brush used to clear away any remaining clouds of blue; and finally, the paper hung up to dry.

The ferrocyanide bath is not subject to change, and may be used to the last drop. If it begins to crystallize by evaporation a few drops of water may be added. The specks of blue which are formed in this bath, if not removed by the subsequent washings, may be taken out at any time by touching them with a weak solution of carbonate of soda or potash. The prints may be colored in the usual way.

A Simple Automatic Railway Signal.

The New York and New England Railroad Company are testing a system of electric block signals which seems to possess rare merit on the score of simplicity and directness of operation. It was invented by Mr. Charles J. Means. Its distinguishing feature is that the danger signal is set mechanically by the passage of a train and locked by a latch lever bearing the armature of an electro-magnet which is charged by the passage of the train over a track circuit-closer at a suitable distance beyond, say one mile, whereupon the safety signal is displayed.

In this way the entrance of a train upon a block automatically sets the danger signal, which remains exposed until the train leaves the block. Any breaking of the conducting wires or failure of the battery causes a continual display of the danger signal until the fault is corrected. As the disks turn to the danger position they close a circuit which causes an alarm bell to ring at the nearest station, thus warning the agent and proving the signal to be in working order. Special signals are provided for switches and for street crossings at grade.

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PARTHENOGENESIS.

BY PROF. C. F. KROEH, OF THE STEVENS INSTITUTE OF TECHNOLOGY, HOBOKEN, N. J.

Recent experiments of the Abbé Giotto Ulivi call in question the theory of parthenogenesis, which is at present almost universally received by beekeepers and other entomologists. Briefly stated, this theory is that queens, while yet in the virgin state, may lay eggs capable of hatching, and that such eggs always produce drones. After the queen has mated with a drone and stored up the spermatic liquid so received in a little vesicle, she may lay at will either drone or worker eggs, according as she does or does not compress this little vesicle at the moment the eggs pass it. Some of the evidence on which this theory rests may be found in an article entitled "Modern Bee Keeping, No. IV.," in the *Scientific News*, November, 1881, p. 345. The received theory also requires that queens and drones can mate only when flying, and that the drones perish in disengaging themselves because they cannot withdraw their organ.

All this is denied by Ulivi. He constructed flat observation hives, in which three combs were placed, one above the other. The two sides were of glass and could be darkened with shutters. Each hive was furnished with a closed tin portico having glass slides and a trap which could be so adjusted as to allow or prevent the passage of queens and drones. By the aid of these hives he performed three series of experiments. In the first series they were filled with bees, stores of honey and pollen, worker and drone brood, and queen cells sealed and unsealed; in the second series the queen cells were left out; and in the third there were no queen cells, drones, or drone brood. In none of the experiments was a queen put into the hive. He then made the following observations:

In five hives the queens, without leaving the hive, were fertilized and laid eggs that hatched into workers and drones.

In four hives he saw the queen mount a drone and curve down the extremity of her abdomen so as to bring it in contact with his virile member. This organ was at least three times too thick to be inserted into the vulva. Fertilization must, therefore, take place by mere touch. Indeed the fertilization of small Egyptian queens by large Italian drones could take place in no other way.

In two hives newly hatched queens were allowed to fly and were captured on their return. They brought with them the ordinary whitish appendage to their abdomen, which has hitherto been regarded as the wrenched-off organ of the drone and the evidence of impregnation. On examination under the microscope this appendage was found to consist of excreta entirely soluble in water and containing no fleshy filaments. The drones of these hives were then imprisoned, and the queens returned to their hives. They laid eggs regularly, but these eggs never hatched. Then the drones were liberated in the hives, the queens mounted them, and the eggs they laid after that hatched into workers and drones.

In three hives the newly-born queens were allowed to fly several times until they returned with the usual appendage to their abdomen. Then they were confined in hives containing no drones or drone brood. One of them did not lay at all. The other two laid eggs regularly, but these eggs never hatched. The two laying queens were then killed and examined, and the three nuclei united and put away for winter. The surviving queen never laid an egg. The following January she was also found dead and examined. In March the colony had neither an egg nor a drone, although there had been plenty of time for a fertile worker to develop if there were such a thing.

It is generally believed that one fertilization lasts a queen for life; but Ulivi saw three queens that had laid fertile eggs refertilize themselves by mounting drones.

He dissected five fertile queens and removed mature eggs ready to be laid from their oviducts just before they passed the spermatic vesicle. These he substituted for others that had been freshly laid, removing the latter to other cells, and isolating both from the other eggs in the hives in which the experiments were tried. The removed eggs hatched, but those taken from the oviducts did not. Under the microscope, six days later, they showed no embryos nor any indication of vitality.

He isolated queens from drones for twenty days and dissected them. Their spermathekas were empty.

He caused queens to hatch in cages, so as effectually to exclude drones, and kept them caged for a long time. On dissection their spermathekas were found empty. The eggs they had laid never hatched.

He caught queens on their return from their so-called wedding flight. Although they brought with them the whitish appendage supposed to be the male organ of the drone, the microscope showed their spermathekas to be entirely empty.

He dissected thirty queens just hatched, and found their spermathekas empty.

He captured a young queen immediately after she had mounted a drone, and found her spermatheka distended and filled with liquid.

He concludes that Leuckardt, who dissected a drone-laying queen, and found no spermatozoa in vesicle, but only a clear liquid, erred in pronouncing her unimpregnated. The clear liquid in the spermatheka was nothing but drone semen.

Having had occasion to transfer a large number of colonies from old-fashioned into movable-frame hives, he observed that, contrary to the established belief, old queens do not lay a disproportionate number of drone eggs. They laid fewer eggs than young queens, but the number of worker eggs greatly exceeded that of drone eggs.

Signor Ulivi, therefore, maintains that:

1. Queens are usually fertilized inside the hives.
2. They are fertilized several times.
3. Drones are not mutilated in the act of copulation. It should have been mentioned above that he several times examined all the drones in a hive in which impregnation had taken place, and found none of the drones lacerated.
4. Every egg that hatches into a male or a female has been previously fecundated with drone semen; hence there is no such thing as parthenogenesis in bees.
5. Every queen whose spermatic vesicle is distended and filled with any liquid whatever has been fertilized.
6. The eggs of a queen that has never met a drone will not hatch.
7. There is no such thing as a fertile worker.

To explain the last conclusion it is necessary to add that Ulivi found by experiment that fertile eggs will keep through the winter and will hatch in the spring. Hence some who have put away colonies queenless in the winter and found brood in them in the spring have been deceived into believing that a worker had assumed maternal duties.

These experiments and conclusions are of the greatest scientific interest as well as of practical utility. If confirmed they will entirely revolutionize an important branch of the beekeeper's industry. The author hopes to have an opportunity of testing the matter by experiment. Comments not supported by experiment would be of little value.

Prehistoric Races of America.

In his lecture before the New York Academy of Sciences, the other evening, on the "Prehistoric Races of the American Continent," Prof. John S. Newberry furnished, perhaps, the finest and most lucid summary that has yet been given of the present state of our verified scientific information as to the mound builders, the house builders, the Aztecs of the South, and the condition of the arts of civilization among these representatives of lost types. So many ingenious scientific romances have been elaborated by speculative antiquaries as to the origin of these races and their possible relation to the prehistoric types of the Old World, that such a *résumé* as Dr. Newberry gave of what is actually ascertained or fairly inferable from the data of mounds, pottery, inscriptions, textile fabrics, and other remains, is peculiarly valuable to the general student, who, bewildered by speculative theories cleverly interlaced with facts, and sadly puzzled by remote inferences stated as verified information, finds himself without a starting-point for the formation of an opinion. While not sharing in the fanatic enthusiasm that places these races in advance of the contemporary civilizations of the prehistoric races of Europe and Asia, and while taking no part in the endeavor to trace a relation between them, Dr. Newberry concedes their progress in certain arts and the magnificent scale upon which their public works were constructed. He regards the mound builders of the Valley of the Mississippi, among whom the symbolical form appears to have been neglected in the construction of their works of sepulture, and the races further west who built in the forms of birds and now extinct animals, as belonging to the same primitive stock, now probably represented by a few tribes of Western Indians—Indians so called for want of a better name, but differing in ancestral descent from the savage hordes to whom that term has been appropriated as widely as the Arab differs from the Persian.

Unfortunately for science, and, perhaps, for Dr. Newberry's view of the subject, the remains of textile fabrics that were buried in the mounds have been destroyed by time and dampness, with the exception of a few shreds, which have been preserved by the salts of copper generated by the utensils with which they were originally interred. These shreds are not sufficient to establish an identity of design between the textile products of the mound builders and the curious blankets manufactured by certain house building tribes extant at the present day. Evidences derived from physical structure are, however, by no means to be disregarded in such cases, and here the testimony is strikingly in favor of the hypothesis that the descendants of the mound builders are to be sought in certain types of so-called Indians in the far West. Dr. Newberry has made a large and valuable collection of the textile fabrics bearing upon the question, and it is a singular fact that the distaff in use among these tribes and the mode of weaving are exactly identical with those of the ancient races of the Old World. One must not be misled by such coincidences, which, though striking and curious, are, like philological analogies and resemblances of root words, to say nothing of designs in the decoration of pottery, insufficient grounds for the assertion of a theory. If, as prehistoric geographers contend, the area now occupied by the Indian Ocean was once the seat of a densely populated continent, it is very possible that some historical relation may be finally made out between the primitive races of the great continents on the surface of the globe, but at the present juncture, as Dr. Newberry shows, there is not even sufficient basis for the most shadowy impression to that effect.—*N. Y. Times.*

Wolves in France.

For a country so long settled and well peopled as France, to be grievously afflicted with wolves, which not infrequently attack men and women, seems a little queer. But the secret of their persistent life may possibly be found that the killing of wolves is deputed to certain officers whose business would fail if the wolves were exterminated. The country folk do not hesitate to charge the official wolf hunters with more discretion than vigor in the performance of their duty. The position of "lieutenant de louveterie" is much coveted, and it is a pleasant one, both for the holder and his friends, as regards hunting, shooting, and social intercourse in the lieutenant's district. The rewards for killing a wolf are now very small, ranging from one to three dollars. The departments most infested demand an increase to fifty or a hundred dollars, so as to make it worth the while of good shots and expert poachers to devote themselves to wolf-destruction. Elisee Reclus has computed that there are 3,000 or 4,000 wolves still in France.

French Field Mice.

Darwin's now familiar paradox, that the fertilization of certain flowers may depend upon the number of cats in their neighborhood, has an illustration now in France, where it may even be carried a step further. Any observer who knows the French rural districts well must be struck by the immense number of mouse holes which may be seen in some places. The surface of the ground at times has quite the appearance of a network of little burrows, where it would be impossible for one of the field-bees required for the fertilization of Mr. Darwin's flowers to find a secure spot for its nest. In the department of the Aisne alone it has just been calculated by a special commission that these field mice have cost the farmers no less than thirteen million francs. The climate seems to be especially favorable to these creatures; and, the population being sparse, the number of cats is few, and the mice increase and multiply beyond belief. Arsenic has been tried in the open; but the hares and rabbits get killed first; and now the plan adopted is to construct heaps or small stacks of straw, to which the mice resort in myriads. These heaps are placed partly below the level of the ground, and securely packed and covered in; being first stored with poisoned beet root, turnips, and carrots. This plan is said to be succeeding well, and without harm to the hares and rabbits.—*Pall Mall Gazette.*

Development in Foot Racing.

The winner of the six day "go-as-you-please" contest, which began in this city February 27, made the unparalleled record of 600 miles. The second in the race covered 577 miles, beating every previous score save his own of 582 miles made in this city a year ago. The winner, Hazael, was on the track a few minutes short of 106 hours.

The scores made by the winners of the various six-day contests that have taken place since 1878 stand as follows:

		Miles.
O'Leary	Astley Belt, London, March, 1878	520½
Rowell	Astley Belt, New York, March, 1879	500
Weston	Astley Belt, London, June, 1879	550
Corkey	First race Championship of England, 1878	521½
Brown	Second race Championship of England, 1879.	542
Brown	Third race, Championship of England, 1880.	553
Hart	Rose Belt, New York, September, 1879	540
Murphy	O'Leary Belt, New York, October, 1879	505½
Hart	O'Leary Belt, New York, April, 1880	565
Rowell	Astley Belt, London, November, 1880	566
Panchot	O'Leary Belt, New York, March, 1881	541½
Hughes	O'Leary Belt, New York, January, 1881	568½
Fitzgerald	Ennis Race, New York, December, 1881	582
Hazael	Contest at Madison Square Garden, March, 1882	600

In the last race, Rowell, who broke down, ran on the first day 150 miles in 22½ hours, the first 100 miles being covered in 12½ hours.

Icebergs.

Ice fields and icebergs appeared off Newfoundland nearly two months earlier than usual this season. The steamship Averill, from West Hartlepool, England, was the first to tell of ice on the Banks, having sighted it in latitude 47° north, longitude 47° west, on February 11. She was surrounded for twelve hours. Nearly every day since then the arriving steamships have reported ice, which has drifted to the southward and eastward. The steamship Vandalia, which passed around the ice field, February 11, sighted two towering bergs about 60 feet in height and 120 and 200 feet on the sides.

The White Star steamship Germanic, from Liverpool, reports that on March 1, in latitude 43° 35′ north, longitude 49° 10′ west, she was confronted with a great field of ice, and did not reach clear water for two hours. This seems to indicate that the ice extended for at least twenty-five miles. As no icebergs were seen, it is probable that in floating 205 miles to the southward and about 90 miles to the eastward they crumbled under the influence of warmer waters. The Belgian steamship Helvetia encountered a field of ice and icebergs, and was forced to run to the southward 80 miles before she got to clear water. The steamship New York, from Bristol, fell in with large fields of ice and bergs, varying from 60 to 300 feet in height, and ran a south-southeast course for 160 miles at slow speed before she found open water. The British steamship Milanese, from Boston, February 18, for London, was so seriously damaged by the ice on the Banks of Newfoundland that she put back to Halifax for repairs.

Herbert Lawrence.

Herbert Lawrence, who died recently in this city, at the advanced age of 94, was one of the oldest shipbuilders of this port. He became a member of the firm of Sneden & Lawrence, shipbuilders, in 1816. Their first boat was the Bellona, Cornelius Vanderbilt, captain, launched in 1817. They launched the first Sound steamers, the President, New York, and others.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

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Lightning Screw Plates and Labor-saving Tools, p. 158.

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Saw Mill Machinery. Stearns Mfg. Co. See p. 156.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

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The Sweetland Chuck. See illus. adv., p. 142.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor, Stiles & Co., Riegelsville, N.J.

Common Sense Dry Kiln. Adapted to drying of all material where kiln, etc., drying houses are used. See p. 157.

Supplee Steam Engine. See adv. p. 157.

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For the Garden and Farm.—A great variety of Seeds and Implements. Send for catalogue. Address R. H. Allen & Co., P. O. Box 376, New York city.

See Bentel, Margedant & Co.'s adv., page 173.

Steam Hammers, Improved Hydraulic Jacks, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Millstone Dressing Diamonds. Simple, effective, and durable. J. Dickinson, 64 Nassau street, New York.

The Berryman Feed Water Heater and Purifier and Feed Pump. L. B. Davis' Patent. See illus. adv., p. 174.

Telegraph, Telephone, Elec. Light Supplies. See p. 174.

50,000 Sawyers wanted. Your full address for Emerson's Hand Book of Saws (free). Over 100 illustrations and pages of valuable information. How to straighten saws, etc. Emerson, Smith & Co., Beaver Falls, Pa.

Eagle Anvils, 10 cents per pound. Fully warranted.

Peerless Colors for Mortar. French, Richards & Co., 410 Callowhill St., Philadelphia, Pa.

For Pat. Safety Elevators, Hoisting Engines. Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 173.

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Elevators, Freight and Passenger, Shafting, Pulleys and Hangers. L. S. Graves & Son, Rochester, N. Y.

The Medart Pat. Wrought Rim Pulley. See adv., p. 173.

For Heavy Punches, etc., see illustrated advertisement of Hilles & Jones, on page 174.

Engines, 10 to 50 H. P., $250 to $500. See adv., p. 173.

Barrel, Key, Hogshead, Stave Mach'y. See adv. p. 173.

Blue Process Paper is made by Keuffel & Esser, 12 Fulton St., New York. Send for circular.

Hand and Power Bolt Cutters, Screw Plates, Taps in great variety. The Pratt & Whitney Co., Hartford, Ct.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 173.

For best low price Planer and Matcher, and latest improved Sash, Door, and Blind Machinery, Send for catalogue to Rowley & Hermance, Williamsport, Pa.

The only economical and practical Gas Engine in the market is the new "Otto" Silent, built by Schleicher, Schumm & Co., Philadelphia, Pa. Send for circular.

Catechism of the Locomotive. 625 pages. 250 engravings. Most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for catalogue of railroad books. The Railroad Gazette, 73 B'way, N.Y.

The Porter-Allen High Speed Steam Engine. Southwork Foundry & Mach. Co., 430 Washington Ave., Phil. Pa.

4 to 40 H. P. Steam Engines. See adv. p. 174.

Ore Breaker, Crusher, and Pulverizer. Smaller sizes run by horse power. See p. 173. Totten & Co., Pittsburg.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) E. E. asks: What are the proportions of aluminum and silver for an aluminum and silver alloy? A. An alloy of 100 parts of aluminum and 5 of silver can be worked like pure aluminum, but is harder and susceptible of a beautiful polish. An alloy of 100 parts of silver and 6 of aluminum is nearly as hard as ordinary silver, but has the advantage over it of containing no metal of a poisonous nature or which can effect a discoloration of the silver.

(2) A. S. M. asks: 1. In passing a current of electricity through the primary of an induction coil, what direction will the induced current take in the secondary coil? Will it be from the inner to the outer coil, or *vice versa*? A. When the current is sent through the primary the secondary current will be in one direction; and when the primary circuit is broken, the secondary current will take the opposite direction. 2. In winding the magnetic coils for telephones, is it possible to so wind them as to produce opposing currents and thus counteract or neutralize the effect of the current, and if so, what is the proper way to wind them to produce a continuous current? A. Yes, they may be wound so as to produce no magnetic effect, by winding two parallel wires with their inner ends connected together as in a rheostat. If the wire is wound like the thread on an ordinary spool of cotton, it will work properly; but there is nothing in a telephone capable of producing a continuous current. 3. Should the magnetic poles in a pair of telephone receivers be of the same sign and the coils wound alike, or should they be of opposite sign and the coils wound in opposite direction, and what direction should the coil be wound for each sign? A. It makes no appreciable difference, since the current commonly employed in telephones is alternating in its character. It is well to have all of the spools of about the same resistance.

(3) D. A. R. writes: I have constructed a dynamo-electrical machine from the drawing contained in SUPPLEMENT, No. 161, and which is shown on the first page. I cannot get any current from it at all. Everything looks all right as compared with the drawings, which I have studied a great deal, and yet I cannot find the difficulty. I connected a small battery, to see if my coils were all right. I found the current passed through, but upon starting the machine the current did not gain any, in fact grew weaker. My armature fits quite close in the magnets—probably a very thin sheet of paper could not be passed between them. The armature is wound with one piece of No. 18 cotton covered copper wire, and the ends soldered on to the section of copper ferrule on the commutator, and the copper springs are made with seven tongues in order to give them a softer bearing on the commutator; in fact, everything looks right, though I do not quite understand how the current passes through the commutator and armature. As the machine is constructed it seems to me the current must be somewhat mixed up there. I did not wrap any cloth around the armature before winding. I used brass in every case mentioned, and when brass was not mentioned I used iron. If you can give me any light upon the subject it will greatly oblige one of your many readers. A. As several of our correspondents have written us that they have succeeded in making operative machines after the directions given in THE SUPPLEMENT, we are obliged to conclude that you have made some mistake. You may have short circuited your magnet wire, or the wire on your armature, or you may have made some mistake in your connections, or in the position of your commutator. It is possible your armature is made of hard iron, or it may be that the wire on the bulh magnet is wound so as to make both poles of the same name. Compare your machine with the drawings in THE SUPPLEMENT, and see if it is in all respects according to the instructions given.

(4) D. D. N. writes: I wish to shorten my needle in surveyor's compass about one one-hundredth of an inch. Will grinding, filing, or wetting the end affect or injure the magnetic strength? A. Somewhat. 2. Can stems of chimneys made of plank be painted so as not to catch fire? A. No.

(5) F. H. says: in making rollers for my printing presses I made them by adding sugar and molasses to the mixture. I tore the rollers in getting them out of the moulds. I tried to remelt them over a water bath, also over the fire in a pan by adding a little water to the rollers after cutting them up in small pieces, but could not get them to melt. Can they be remelted, and if so, will you kindly inform me how? A. Cut fine, add a small quantity of glycerine, and continue the heat for some time. See that the moulds are well oiled.

NEW BOOKS AND PUBLICATIONS.

FIFTY YEARS OF SCIENCE. By Sir John Lubbock. London: Macmillan & Co. 8vo, cloth. pp. 90. 75 cents.

A library edition of the notable presidential address of Sir John Lubbock at the York meeting of the British Association.

THE STUDY OF TRANCE, MUSCLE READING, AND ALLIED NERVOUS PHENOMENA IN EUROPE AND AMERICA; WITH A LETTER ON THE MORAL CHARACTER OF TRANCE SUBJECTS, AND A DEFENSE OF DR. CHARCOT. By George M. Beard, A.M., M.D., New York.

This privately printed pamphlet is sufficiently described on the title page as above. It is largely a defense of the author's "concentration" theory of trance and of the correctness of his interpretation of the facts of "mind reading," or, more correctly, muscle reading.

THE SECRET OF WINGS. By George B. Starkweather. Washington: H. W. Beadle & Co. 50 cents.

Mr. Starkweather is an acute observer and a caustic critic. His pamphlet is decidedly entertaining; but as a practical contribution to the promised art of aerial navigation it might be more valuable if it gave an explicit statement of how, in the author's opinion, the "secret of wings" is to be applied in a flying machine.

[OFFICIAL.]

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired and remit to Munn & Co., 261 Broadway, corner of Warren Street, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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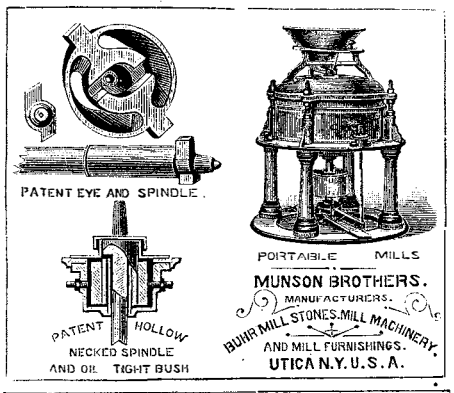

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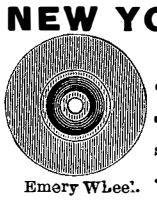

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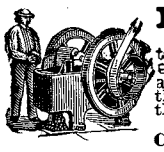

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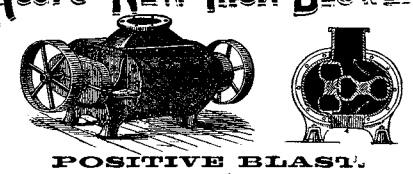

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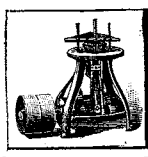

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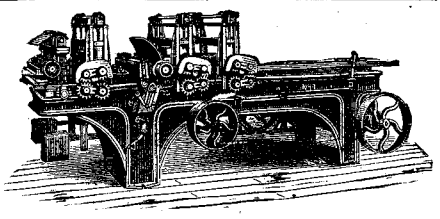

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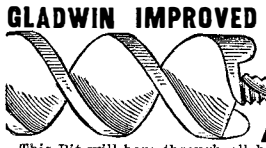

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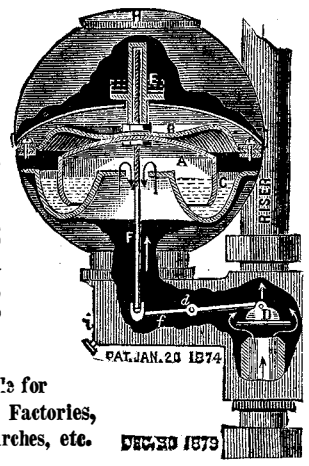

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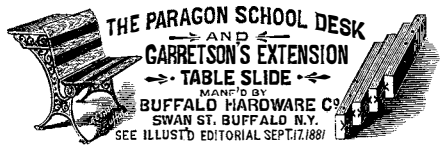

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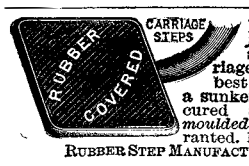

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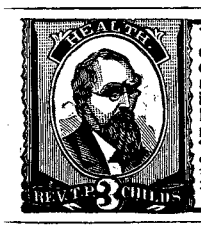

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